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Canada and Chicago.

THERE are men connected with the British electrical industry who have devoted so many years' thought to the subject of our electrical export trade with Canada that it has become one of their life problems.

Interest in the situation has occurred in waves during the past twenty years and more. It is only typical of the dogged persistence and perseverance of our race that every year or two new men have come forward filled with determination to surmount the peculiar difficulties and to find ways for securing to British electrical products their due recognition and adoption. The vastness of Canada, the immensity of the scope offered to our people through the great national resources of a new world, and the ever-increasing need for population-relief for the Motherland—all these and many other considerations have surrounded the Dominion with an atmosphere of romance and that spirit has naturally had associated with it a home desire to do better business with our kith and kin there, finding increasing employment for our people.

More electrical men have visited Canada to investigate British electrical trade possibilities than have gone to any other electrical market—that is, judging by the number of them who have discussed their experiences with us—yet the actual progress made during a lengthy period has amounted to so little. Also, more electrical men from Canada have conversed with us here on the chances of securing British trade agencies there than have come from any other market, though visitors from Australia have run them pretty close. Many have been the efforts made by private individuals, by co-operating companies, and by associations, to promote new trade, but the actual advance made has been far from commensurate with the effort taken.

Only the newest entrants to the industry need to ask: "Why is it?" Sometimes it is said that our manufacturers have been lacking in enterprise—have neglected the market; this we know is not so in a number of cases. We have too close a knowledge of their endeavours to credit that statement to-day. It is true that the effort in certain instances has been

only half-hearted, but this has been due to the impression, not without justification, that there were handicaps in the Canadian market which existed in no other part of the world save the United States. Therefore, when there were many more promising fields open to them, our firms used their enterprise where it was more likely to bring a reward. Why bang your head against a stone wall in Canada when other countries give easier access? But the acceptance of that state of things as inevitable does not last long with British manufacturers, and it is gratifying to be able to congratulate those who decline to sit down despairingly and do nothing. Grievances have continued too long already, and they will only be removed by persistence and publicity. All honour to those who take the initiative in bringing about a change!

We venture the view that whatever other handicaps there may or may not have been, the one that has been directly and *indirectly* the most serious deterrent to British progress has been the influence of the Chicago Board of Underwriters through its Electrical Rules and Regulations. The attitude is not free from what looks very much like definite obstruction, for certainly from what we hear, irritating difficulties are placed in the way of those seeking approval for British manufactures which are superior to much other product that is permitted or approved. However real this Underwriters' difficulty has been in actual fact—and its seriousness has varied in degree with different products—there has always been a Chicago smoke pall over Canada which has had a restraining influence upon our trading concerns.

With the Electrical Review and its readers and contributors the whole subject is one of long standing. We have supported all efforts that have been made to bring relief to British firms. Fourteen years ago, as the result of operations in connection with which we and our representatives took no small part, we published a report by Mr. C. Hamilton Wickes, then H.M. Trade Commissioner in Canada, in which the effect of the Underwriters' Code upon British trade was dealt with in great detail. Since that date (Elec. Rev., January, 1913) many things have happened, but British traders' wrists are still shackled by Chicago. No British or Canadian trader can feel that we are being fairly dealt with until this restraint is either removed or substantially modified.

We publish two articles to-day in which this and other aspects of the Canadian situation are reviewed, and we hope that the attention that is now being given to the subject will bring about the desired result—reasonable approval of British electrical material and manufactures on the basis of quality, safety, and other merits, taking the place of rejection through prejudice or irritating objections in matters of unimportant detail.

Electricity in Agriculture.

We all know the reputation of "hope deferred," and some of our readers who have followed, perhaps with waning interest, our quarter-of-a-century's advocacy of the application of electricity to farming, may have little faith in the future of that branch of electrical activity. But the omens are favourable, and there are good reasons for believing that the subject will come into prominence in the not-distant future. That the leaders of political parties are interested in the extension of electricity supply to the rural areas is, of course, well known, but we do not attach much importance to that fact; the matter is now in the hands of the Central Electricity Board and will be dealt with as and when conditions permit of it—not much is to be expected from that quarter for some years to come.

But in other ways real progress is being made, which should make itself felt quite independently of State action. The chief obstacles to the application of electricity to farming have been the relatively high cost of the supply mains and the low value of the small and intermittent demand for electricity in farming operations, two factors which entail a high price for energy and thus restrict consumption. So long as the lighting of the farmhouse and the occasional driving of a few small motors constitute the farm load, the business cannot prosper. The remedy is to be found in the heavier applications of electric power, namely, to ploughing, harvesting, &c. Elsewhere in this issue Mr. R. Borlase Matthews gives an account of a remarkable development, on sound commercial lines, of the artificial drying of crops, with the aid of power-driven machinery, which will greatly increase the duration as well as the magnitude of the farming demand. We have reason to believe, too, that the system of electric ploughing devised by Major A. McDowall, which has been described in our columns, has aroused practical interest in influential quarters and is being closely investigated; this system permits of the electric tractor being used for harrowing and other cultural processes involving haulage on the land—an important feature, because it is of little use to replace horses for ploughing if they must still be retained for other operations. Again, the extremely interesting and instructive lectures delivered at various centres in Great Britain and Ireland last year by Dr. A. Ekström made it clear that a supply of electricity immensely facilitated agricultural operations, and that in Sweden this agency was eagerly availed of by the farmers. Another favourable indication is the strong movement towards the use of electric cooking and heating apparatus, which, stimulated by the coal shortage, and fostered by the E.D.A.-E.L.M.A. campaign, is continually gaining strength and will inevitably be felt in rural areas.

Hence the tendency is towards removing the obstacle of small and fitful demand, and obviously, amendment in this respect diminishes the importance of the cost of overhead lines—here, as elsewhere, improvement in load factor is an infallible remedy for high capital charges. If now the Electricity Commissioners would take measures to facilitate the erection of cheap overhead lines in rural areas, a further important advantage would be gained. The development of the rural load was largely relied upon by the Government advocates of the Electricity Bill as a means of improving the general load factor, and they were reminded of it in the House of Commons twice last week.

Hackneyed though the subject may be, we must insist upon its importance; every endeavour should be made to educate public opinion and to pave the way to development in this direction.

Anglo-Australian Wireless Telegraphy.

To-day, we learn, the wireless "beam" service between the Home country and Australia will be opened for public traffic. This is the first wireless channel for regular communication between the two countries on a commercial basis to be brought into existence; it is the longest direct telegraph service in the world. It has a duplex capacity of no less than 100,000,000 words per annum, and is available by day and night.

Do we fully realise the meaning of this stupendous achievement? Even five years ago the feat was utterly impossible—a mere dream of the future, if foreseen at all. We British are only too ready to find fault with ourselves, but slow to take credit for our triumphs. Let us try to view this event in its true light: it is, as we have said, a stupendous achievement, worthy to rank with any of the marvels of science with which the past half-century is adorned. It is the work of two associated concerns—Marconi's Wireless Telegraph Co., Ltd., and Amalgamated Wireless (Australasia), Ltd.—and has been developed under the personal guidance and supervision of Senatore G. Marconi, with the benevolent support of the British and Australian Governments. To all these, but especially to Mr. Marconi himself, we offer our heartiest congratulations.

Electrical Development at Ilford.

The conversion of the 1,000-kW manually-operated rotary sub-station at Goodmayes to automatic working, utilising the existing machines and introducing some new and interesting features in automatic installation work.

AN official inspection of the electricity works and sub-stations of the Ilford electricity supply undertaking on Saturday last marked the completion of an interesting job at Goodmayes, and an important stage in both the development of electricity supply at Ilford and the installation of automatic sub-station equipment generally.

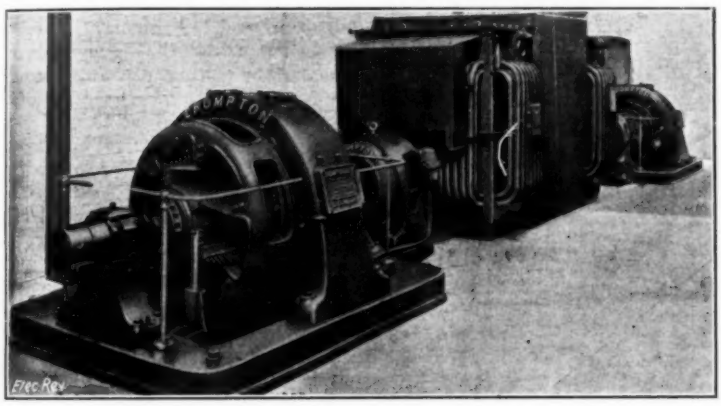


Fig. 1.—Rotaries and Transformers.

The Goodmayes rotary-convertor sub-station, which was up to a few months ago manually operated (ELECTRICAL REVIEW, April 30th, 1926, p. 688), has now been converted for either full-automatic or remote-control working. The existing plant of the "sub" has been utilised practically in full for the new scheme, the only alterations being the provision of thermostats and other minor apparatus on the machines and transformers, to give the more complete protection necessary, the replacement of the main h.p. and l.p. circuit breakers, and, of course, the addition of the actual apparatus for automatic control.

The scheme is of increased interest in that it is believed to be the first of its kind where the machines can be guaranteed definitely to run up with the correct polarity for synchronising. Each convertor is run up to nearly full speed by a pony motor, when synchronising current is supplied by means of a special transformer. This current is within the limits necessary to avoid any reaction on the phase sequence built up in the machine itself, under the influence of the driving motor, but is sufficient to bring the machine definitely into step.

The sub-station works in conjunction with two ring-main systems and is fed at 6,600 V, 3-phase, supplying at 500 V d.c. to the local networks.

Two standard 6-phase, 500-kW Crompton rotary convertors, directly coupled to pony motors for starting, are installed, and receive the incoming supply at 355 V from two 3- to 6-phase British Electric transformers. These are equipped with coil tappings for 2½ to 5 per cent., above or below, voltage regulation. Fig. 1 shows the rotaries and the transformers. The h.p. switchgear, fig. 2 left, is of the cubicle truck type, duplicate busbars with the necessary change-over switches being provided. The equipment includes two incoming, two transformer, and one p.l. panels, a.c. being used for street lighting in the district. As already indicated, the old transformer switches have been replaced by others suitable for automatic working; these are interlocked with the trucks, but the interlocking is so arranged that it is closed by the switch but can only be opened manually. The h.p. and l.p. breakers, a.c. and d.c., are so interconnected, through lock-out relays, that in the event of a fault on either the a.c. or d.c. system the breaker on the other side is thrown out. A separate flat-type switchboard, fig. 3 and fig. 2 centre, accommodates the automatic equipment.

With a definite drop of voltage across the d.c. bars, a governor relay is energised and closes an a.c. low-voltage contactor which, if the a.c. pressure is up to normal, closes a governor contactor, thereby completing the operating circuit to a timing motor. This, with the rest of the sequence control apparatus for each machine, is housed in a glass case, the whole being of a very substantial design. The timing motor, through a suitable train of gearing, drives a common shaft to which are fitted a number of contacts and a

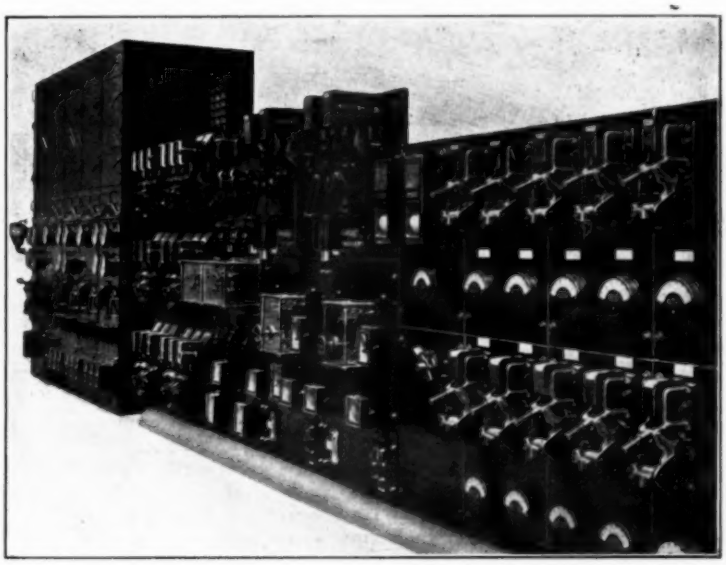


Fig. 2.—Complete Sub-station Switchgear.

system of magnetic clutches for operating, in the correct sequence, the various circuit-breaker relays. A hold-on coil is also fitted, and is closed simultaneously with the first clutch. This is energised as long as the machine is running, but as soon as the latter is stopped it is de-energised and allows the timing mechanism to return to the "off" position. After a definite time delay of 10 seconds, the first contact switch is closed, providing an alternative path for the operating current, the main governor relay remaining closed, whether the d.c. busbar voltage is normal or not. After a further delay of 5 seconds, the second timing

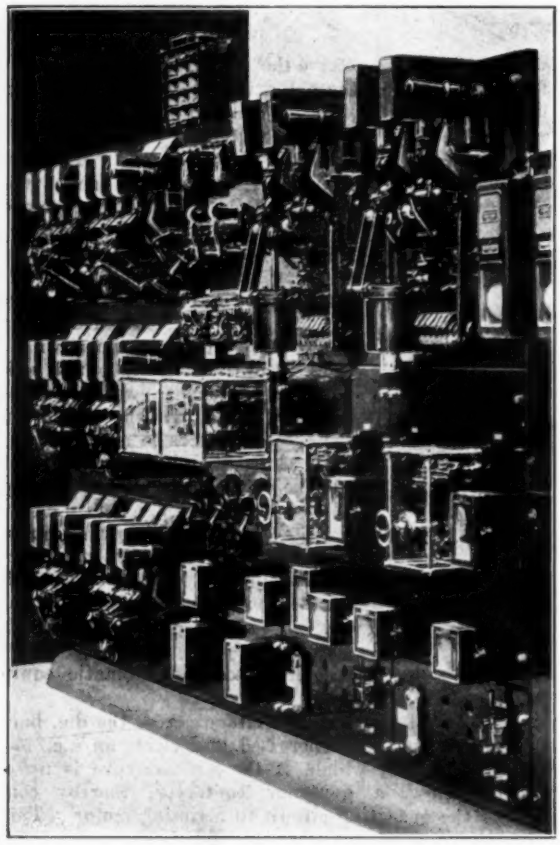


Fig. 3.—Automatic Switchgear.

switch closes and completes the supply to the main operating solenoid of the a.c. oil switch which connects the main transformer to the a.c. system.

With the oil switch closed, a contact switch completes the operating circuit for the coil of the first starting contactor: this is thrown in and the pony motor is connected to the supply, starts, and runs the rotary up to nearly synchronous speed. After a further time delay of 40 sec. another switch of the timing mechanism closes and operates the main synchronising contactor. This connects the rotary convertor to the special synchronising transformer, fig. 3 top left. Another lapse of five seconds, and the last timing switch closes the running contactor, connecting the synchronised rotary to the a.c. system, and at the same time opening the pony-motor and synchronising contactors.

The machine is now self-excited, and running at the correct speed, the supply being carried through polarised and correct-voltage relays. As the latter closes at the correct pressure, the main solenoid of the d.c. breaker is excited, connecting the convertor to the d.c. busbars. This operation connects the supply through the governor relay, which, with the increased pressure, opens and disconnects the timing motor and mechanism. Each machine is started up in a similar manner, duplicate equipment being provided for each, except that the timing mechanism of the second or any subsequent rotary is brought into operation by means of a d.c. loading relay, set, of course, at a predetermined load value. Underload relays provide for the shutting down of the machines. Each of these, on a predetermined loading, connects the timing mechanism in the reverse direction, and the machine is shut down after a time-delay of 15 minutes. To ensure against a polarity reversal on the d.c. side, a suitable relay, interconnected with the lock-out relay, is installed for each machine. Overload, reverse-current and no-volt relays are installed in addition to the other protective devices which have been mentioned. Provision is also made for the machine to shut down should the d.c. breaker fail to close within 5 min. of the completion of the previous sequence operations. A system of sequence switches enables the machines to start up automatically in any order.

For the remote control of the sub-station, a small pilot control board, fig. 4, is housed in the main generating station and enables the operator to stop or start at will either of the rotaries, and also to see at a glance which, if any, of the machines is running. The pilot board is equipped with two indicators and two two-way switches, one of each for each machine. Each indicator is connected to the d.c. bars at the generating station and by means of a pilot wire to the neutral at the sub-station end. A differential relay is employed in conjunction with the remote control apparatus, and operates the timing mechanism to start or stop the rotary according to the position of the control switch. By the insertion of additional resistance in the indicator circuit when the rotary is stopped, different scale deflections are obtained for "run" and "stop," and the scale is marked accordingly.

Arrangements are made for the hand control of the whole of the equipment in the case of emergency.

A particularly interesting feature of the equipment is the automatic voltage regulation. A shunt field regulator is provided with a pressure relay which has its main coil connected directly across the d.c. terminals of the machine. A central contact arm will, according to its position, make contact with either of two terminals of two operating coils equipped with plungers. The plungers are coupled by suitable driving mechanism to a common disk. According to the

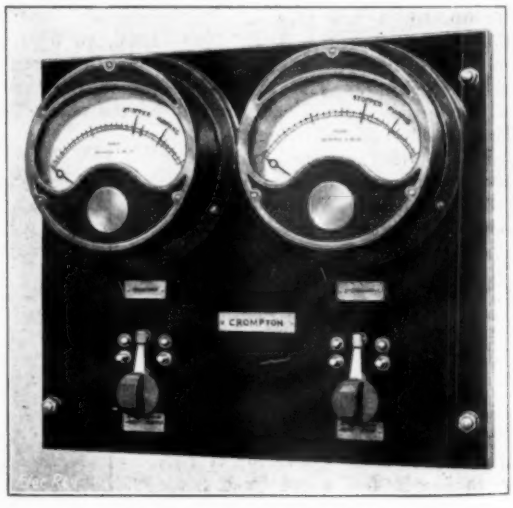


Fig. 4.—Remote Control Board.

direction of travel of the disk, the regulator will be operated to increase or decrease the pressure. It is claimed that the apparatus will result in a pressure accuracy of within 2 per cent. either way.

The load balancing is effected by means of a relay governor controlled by the busbar pressure.

The whole of the work on the change-over scheme has been carried out by Messrs. Crompton & Co., Ltd., under the direction of Mr. A. H. Shaw, M.I.E.E., borough electrical engineer, and most of the automatic equipment was supplied by Messrs. Whipp & Bourne, Ltd.

Electro Farming.

A new continuous crop-drying process, which offers the prospect of an attractive load for the central station and prosperity for the farm.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

NOT only is the problem of haymaking by artificial methods receiving renewed attention in this country, but American engineers are also seriously studying the proposition. Mr. Arthur J. Mason, who was one of the leading American engineers in developing mechanical methods in the steel industry, has been studying and experimenting on the hay-drying problem for the past fourteen years, and has spent over £20,000 in developing a mechanical system for handling and drying crops on his own farm at Flossmor, near Chicago, Illinois. During last season, the first commercial plant was installed on the Walker-Gordon Dairy Farms at Plainsboro', New Jersey, on which there are 3,000 head of cattle, consuming a great deal of fodder.

It might be of interest to explain how Mr. Mason approached the problem. In the first place he was struck by the lack of continuity of operation in agricultural work; for instance, haymaking takes on an average only a few days a year, and all the haymaking machinery lies idle for the rest of the time; and secondly, he was impressed by the fact that artificial drying had displaced natural drying in practically every industry except agriculture. Though this may not occasion any surprise to the engineer, it is most certainly a very strange gospel to the average farmer. It was only a short time ago that the author, when delivering a lecture on his method of artificially curing hay, was taken to task by a practical farmer because the new system he advocated involved the spending of money in doing something that Nature would do for nothing. Of course this is not the view taken by all farmers, but it is general enough to make it necessary to warn engineers of the fact and so make them realise the importance of demonstrating to the farmer that what has been done for other industries can be done for agriculture. The farmer must also be taught that the secret of low costs in the making of bricks, cement, salt and similar products lies in the fact that they can be made on any day in any season and that it is not necessary to wait for the sun to appear before the moisture can be extracted. Important as this change was in these industries, it is far more important in agriculture. Under the old system, say with bricks, those that could not be made one day could always be made at a more favourable time, and every stoppage owing to weather conditions only postponed the operation (and incidentally delayed and restricted deliveries and reduced profits). In the case, however, of farming, apart from the losses cited, if the crop is not cut at the correct time, a great deal of its value is lost, and if the weather is unfavourable, the crop is often ruined.

Not only is an artificial method necessary to improve present practice, but a change of method would open up tremendous possibilities; for instance, there are crops such as lucerne, which grows in abundance in damp climates, yet the very conditions which are favourable to its growth are dead against its successful harvesting; this is, no doubt, why so little lucerne is grown in this country. It is one of the most profitable of crops; a good acre of it will support three times as many cattle as an acre of any other crop. It also binds the land together and enriches it by a process of fixing nitrogen by nodules on the roots. It is claimed by Mr. Mason that at least two, and sometimes three, crops could be grown in one season. Of course, these could not be harvested in the ordinary way, but if mechanical methods were introduced which could cut, carry off and dry the crop in a short time, this would be possible. In fact, Mr. Mason has already done it. He is now farming 600 acres in Illinois, and the crops are on their way to market within a few hours of the time they were growing in the fields.

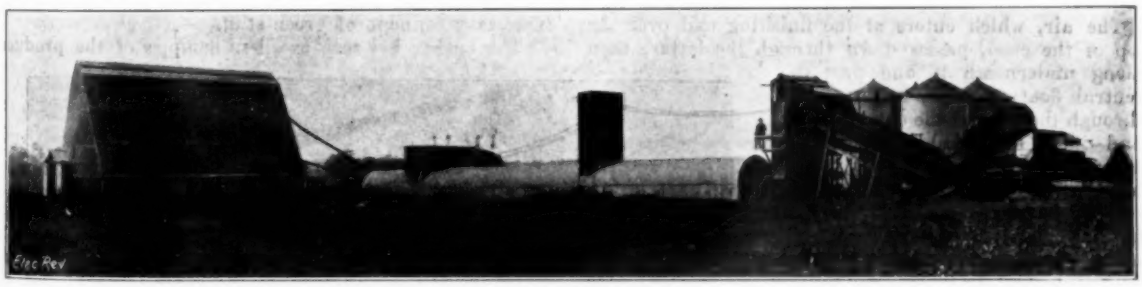


Fig. 1.—The Mason Continuous Hay-drying Plant.

A modified harvesting machine which is drawn by a tractor cuts the crop, chops it into lengths not exceeding 9 in. and delivers it automatically, by means of a special elevator which forms a part of the machine, into a lorry with a capacious steel tipping body about 8 ft. wide, which is driven alongside the harvester. When the lorry is full, another takes its place alongside the harvester, while the loaded one goes off to the drying plant. As an area of 600 acres is a large piece of land, it will mean a haul of 2 to 3 miles, on the average, hence one harvesting machine will probably keep three lorries fully occupied. The crop is tipped from each lorry on to an elevator (fig. 1, right) which is operated by a 10-h.p. electric motor; this carries the crop up to a height of about 20 feet. From here it passes through some spiked rollers or beaters, where it is combed and prepared into an endless mattress of uniform texture, 8 ft. wide and about 10 in. thick. This mattress, which fits closely to the side of the container, is then delivered by a chute on to a horizontal conveyor band, 160 feet in length, which is driven at a speed of about five ft. per min. by a 10-h.p. motor. This conveyor, with the exception of ten feet at each end, is enclosed in a drying tunnel about 8 feet high, made of corrugated, curved,

galvanised sheets (fig. 1, centre). The rectangular vertical structure in the centre is the discharge stack for the used air and gases. The hot-air fan is positioned at the far end of the tunnel (fig. 2, left centre). A floating door which rests on the crop is placed at each end of the tunnel (fig. 3), and another is placed at 60 feet from the finishing end door, so as to cut off the inlet heated air from the escape stack. Heated air at a temperature of about 250 to 275 deg. F. (or for non-leguminous crops, up to 400 deg. F.) is blown in at the finishing end, over the top of the crop. An 80,000-cu. ft. fan, driven by a 30-h.p. motor, is em-

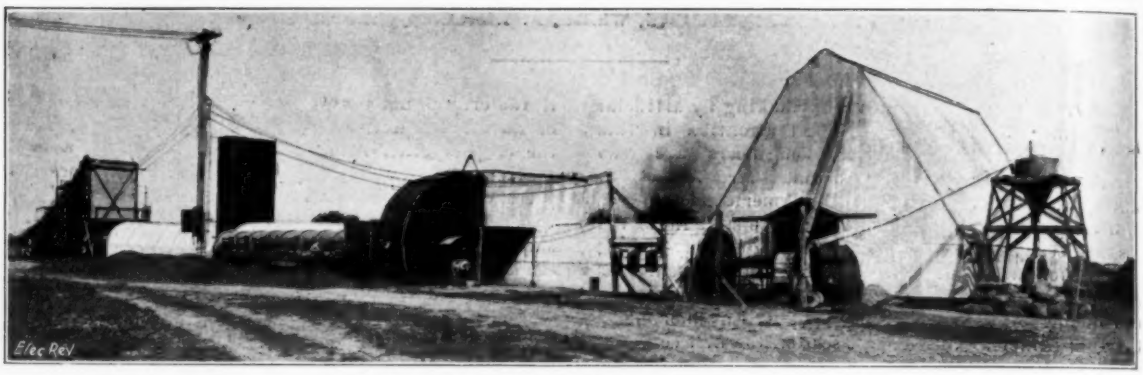


Fig. 2.—The Mason Hay-drying plant, seen from the other side.

ployed for this work. The air is heated directly by an anthracite coal fire. As this coal is free from smoke, sulphur and deleterious fumes, there is no objection to this method. With other fuels, such as ordinary coal, coke, or oil, only indirect heating can be employed, which, of course, is less efficient: About two pounds of dried crop are obtained per pound of anthracite coal consumed, or 20 tons of crop for 8½ tons of coal per day of ten hours. By the time the air gets to the inlet end of the conveyor, its temperature has fallen to about 130 deg. F.

The air, which enters at the finishing end over the top of the crop, passes down through the latter, then along underneath it and past the central floating door; it then rises through the crop at the entering end and in a saturated state escapes through the vertical stack. On leaving the tunnel the dried crop is fed by a cross conveyor into a chaffing machine. After this it may either be bagged or baled (with a 15-h.p. motor) as it is, or alternatively, if the crop is lucerne, it can be reduced to a powder in a disintegrating machine. The latter requires a 40-h.p. motor to drive it, including the operation of a fan to blow the finished product through a delivery pipe. In the case of the Plainsboro' plant there are two such pipes; one leads to a barn, equipped with storage bins with a capacity of 200 tons, and the other to a cyclone double sack-filler. These pipes are made of light galvanised sheet-steel tubes and are ingeniously suspended on a steel rope, fig. 3. In this way, it is claimed, a crop growing in the field may be converted into hay and baled ready for transporting in forty minutes, the whole operation being carried out without handling by a single individual.

The plant will cure 20 tons of hay and bale it in 10 hours (two tons per hour), and the labour required is one man for mowing, three men and lorries for hauling, and four men at the plant. The amount of coal used in the heaters is about 8½ tons per day. By the process, seven men working on 600 acres for 165 days of the year can deal with over £12,000 worth of products.

The cost of the plant, including all machinery, tractors, electric motors and storage plant would seem very high to the ordinary farmer, as it is about £4,500. However, it must be borne in mind that it deals with the crop from 600 acres of land. The annual cost of operating is about £4,200; this includes fuel, allowance for rent of ground taken up by the plant, and the wages of each workman at £4 per week. Hence a product worth £12,000 is created by an installation costing £4,500. The possibilities of improving the farm load with such plants may be gauged by the fact that it is necessary to use 90-h.p. for ten hours per day for about six months of the year when working on lucerne alone. In the Chicago district a month's work can be found before May 15th on winter rye, and after October 15th a month's work on peas. Thus it is not difficult to visualise what such a load would mean in rural areas. No longer would central-station engineers see such difficulties in the way of providing distribution lines for the farmer. The makers are prepared to erect the plant at their own cost on the basis of a royalty on the output. They will also provide plants for groups of farmers who are prepared to contract to supply the necessary tonnage of green stuff.

The author has seen excellent samples of the product

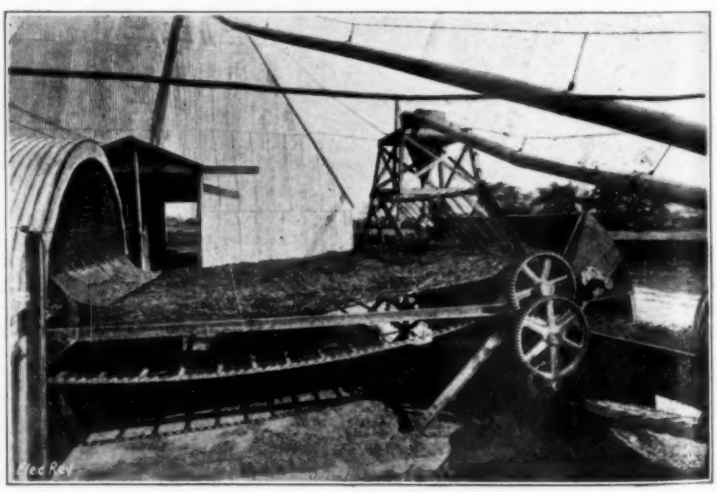


Fig. 3.—Delivery end, showing the chaffing machine on the right.

of this plant and has sampled the powdered form of lucerne which has been suggested as suitable for human consumption; when cooked it looks like spinach. Of course this material has been successfully used for a long while for chick-feeding at times of the year when it is impracticable to obtain green vegetables or other stuffs rich in vitamines. The author is also assured by Mr. Mason that the hay has passed the highest court of reference: the cattle never hesitate between the so-called natural and the artificial, and always ignore the former if the latter is available.

Mr. Mason is confident that the adoption of similar

methods in England would result in a revolution of the agricultural industry; he states that our moist climate, which is now a liability, can be turned into a great national asset; we should devote our land to forage crops, cut them at the milk stage and then artificially dry them. This would result in the grain crop yielding three times as much animal food as it does now, at least two crops per year, and the culture of lucerne becoming possible, giving 6,000 lb. per acre per year of dry material containing at least 18 to 20 per cent. of protein, as against 14 per cent. (or less if exposed to rain) of sun-made lucerne.

The arguments that are employed in favour of other methods of artificial crop drying apply also to this method. The process can, of course, be carried on during wet weather, as long as the lorries can be run on the land. If chain-track vehicles are employed, there need never be any stoppage for weather conditions.

Here, then, is a new aid to agriculture: a process that enables the farm to operate more along the lines of the factory—and that seems to be the only salvation for the agricultural industry. It is certainly a matter of very great importance to this country and can easily be worked along somewhat similar lines to those adopted for sugar-beet factories. The capital required is infinitesimal when compared with that necessary for such factories; but the farmer has to be convinced, publicity is needed, and confidence has to be instilled. However, the engineer can render considerable assistance in this direction, so let us get on with the good work.

Some Reminiscences.

By a Quondam Apprentice.

TEMPERAMENTALLY thoughtful, and inured to grappling with ever new technical problems, the electrical engineer is apt to consider life a serious business; apart from an occasional smile at the mirth-provoking troubles of the ubiquitous salesman, and his funny stories, he finds little to laugh at. Nevertheless, to most of us, a retrospective glance of memory at the days of our probation reveals a picture of the lighthearted and irresponsible game of electrical engineering as it used to be played in those days.

My own vivid impressions of experiences gained in a small manufacturing shop, manned by equal numbers of workmen and apprentices, fill me now with wonder and amazement—wonder at the tremendous change that has taken place in designs and methods since then, and amazement that with such a state of things a works could ever have been made to pay. Never, surely, was so diverse and withal so irresponsible a company of boys gathered together in one small shop. Nicknames there were for every one, and the workmen were not exempt. One, the young father of a rapidly-growing family, Arthur —— by name, became known as "Arthur-any-more?"; whilst the pattern-maker was rather unkindly given the sobriquet of "Warpy"—a sly reference to the conveniently unseasoned quality of the wood used for his patterns.

"Mack," the shop foreman (of Scottish extraction), whose real name I—and most of the others, I fancy—have forgotten, was at times not immune from the prevailing spirit of folly. Once, requiring some buckets, he sent a boy for them. The lad returned with three.

"What have ye brought them old things again for?" he demanded. "They're leaky: I told the governor I wanted new ones weeks ago."

Taking the buckets from the boy, he upturned all three. "There, now, that's one; that's two; and that's three" (driving the point of a chisel through each in turn). "The governor'll nae doot be able to see the holes the noo."

Even the classes at the technical college were by some regarded as an entertainment—as when the only note made by one of the students was to the effect that Mr. Brown, the lecturer, had "wished everyone a happy new year." The said Mr. Brown, being a practical man, delighted in reliability, and would sometimes hyperbolically describe an armature of which he approved, as one that "might be struck with a sledge hammer without injury." This so impressed our apprentices that one day "Brown's test," as it was called, was wantonly applied to a small armature at the works! The fact that it failed to pass the test was, however, not reported.

The proprietor of the works was, on the whole, an easy-going man, though equipped with an amazing vocabulary which he reserved for special occasions. When in the works he invariably wore a favourite dilapidated straw hat. Always on entering the office he would change his hat or cap for that badge of authority—the ancient straw. There was a legend current to the effect that he had started the works with the assistance of a legacy which was conditional upon his wearing his benefactor's old hat at least once daily.

It was easier then than it is now for employers to impose fines for infringement of rules. One of his rules, that outworkers should make good half the cost of any tools inadvertently lost or left behind on outside contracts, had the curious, though not altogether inexplicable, effect of actually augmenting the shop's small tool equipment.

His right-hand man, and almost constant attendant, was the draughtsman, a quiet-looking individual with tired eyes. When the firm's prosperity had begun to wane, and our employer was becoming morose and irascible, he was giving the draughtsman instructions regarding a dynamo for which he had just obtained the order; and he explained that certain old parts which were in stock were to be used. "We must make a profit on this machine," he said. "Use all the odd parts you can find—build up the machine from the scrap heap, if possible."

"I never know what you call the scrap heap," said the draughtsman, meekly.

"Why, the whole b——y shop, of course," the boss replied. (I regret the adjective, but truth compels.)

At that time it had become the custom on a winter's morning for the workmen and apprentices to gather in a group around the smithy fire in the early morning to discuss the prospects of the local football team, political questions, and that perpetual, favourite, vital subject, the mistakes and failings of the boss. These proceedings usually terminated abruptly owing to the unwelcome arrival of the subject of discussion, whose approach was heralded by his dog, which always preceded him. When the dog died, an effective warning signal was arranged by opening wide the throttle of the electric lighting engine and overrunning the lamps by several volts. This invariably induced the chief, immediately on his arrival, to go first to the engine room and lower the lights.

Through it all, though, some of us did manage to get an initiation into electrical engineering; and perhaps the close contact with practical work, and the rubbing of shoulders with workmen, had their advantages, for which the modern system of engineering training offers no exact equivalent.

That old works was closed down long ago, and ultimately demolished. The picture house since erected on its site is no doubt a more profitable venture—at any rate, for its promoters—than any merely utilitarian concern, such as an electrical engineering works, could ever be. The apprentices who served their time there are now widely dispersed, some to positions of responsibility, some into other trades, and some in no position at all. Yet to all of them the remembrance of their early training must at times bring some amusement, tempered perhaps with a feeling of regret for their follies. Those halcyon days!

Bigger British Trade in Canada.

Some reasons why we are not doing it.

COMPLAINTS are frequently made by British manufacturers that the Canadian market is unsympathetic to British-made equipment, and that American influence dominates Canadian buying. We publish below two important articles dealing with the situation and we commend the observations of our contributors to the serious attention of British manufacturers and exporters.

The writer of the first article—an English engineer who has been resident in Canada for 10 years applying British engineering equipment to Canadian conditions—holds that basic misunderstandings of the Canadian outlook and requirements exist in the minds of many British manufacturers and that these misunderstandings and not any underwriters' regulations or prejudice for American manufactures are principally responsible for more British equipment not being used.

The author of the second article is a Canadian correspondent who has had lengthy practical electrical engineering experience both in this country and in Canada. He holds that great as is the influence of the Underwriters' Laboratories in handicapping the British manufacturer, it is not responsible for the whole, or even the greater part of America's electrical success in Canada. Yet British articles of workmanship superior to American and at least as safe are not being approved, and European products are in consequence not available. He shows that Canadian electrical men object, as do British manufacturers, to electrical goods for sale in Canada having "to be approved in a foreign country," and he refers to the steps that have been taken to formulate a Canadian Electrical Code as a step towards emancipation.

I.—Handicaps to British Business.

(Communicated.)

It is a common occurrence to read and hear complaints made by members of British manufacturing companies visiting Canada, who undertake to enter the Canadian market either by establishing branch assembling or manufacturing plants in Canada or by establishing representatives to solicit business on their behalf. The nature of the complaints is almost always the same, and is to the effect that Canadian policy and practice are completely under the influence of the United States, or the American underwriters—that British equipment is not wanted and that Canadians put forward requirements which are frequently designed to exclude British companies from supplying it—that the requirements are unnecessary and unreasonable—that standard British equipment will actually meet the case, &c.

In the vast majority of cases, these complaints are not justified, and a more careful study and investigation, undertaken with the definite object of securing a real understanding of the Canadian point of view, would show that the British company is probably at fault.

The statement that American example dominates Canadian practice will first be dealt with. It is admitted that there is a great similarity between the general electrical engineering policies and conventions of the two countries, but this is to be expected on economic grounds alone on account of the exact similarity between problems to be solved in each country; British problems are totally different, and require a correspondingly different treatment.

The fundamental nature of the differences is as follows:—

(1) In Canada principally, and the U.S. largely, electrical energy is generated from water power. It is transmitted relatively great distances by overhead lines to distribution centres, which are widely separated and spread out and consequently must serve much larger areas than would be the case in England. The distribution networks are still principally overhead, and even where the larger towns have begun to put in underground cables, the load density per square mile is far less than is the case under similar locations in England, despite the larger energy usage per person in Canada. This is because the towns in Canada have their populations and industries spread over wide spaces and not concentrated into small areas as is unavoidable in the older countries.

It is at once obvious that distribution systems built as in England would involve expenditures quite out of proportion to the revenue earned. This condition has made it an economic necessity to develop distribution apparatus and equipment of the simplest and least expensive nature without undue sacrifice of reliability and efficiency. These latter factors cannot be, and are not, however, given anything approaching the same weight as in England when distribution systems are laid out. This affects sub-station layout and equipment, the pole line hardware, transformers, protective devices, wire and wire insulation, all of which, as used in Canada, would be considered far below permissible standards in Great Britain. This is not a matter of copying American practice, however; it is the spur of economic necessity, which incidentally has for the same reasons produced similar solutions to the problems arising.

(2) Industrially, the economic differences have compelled correspondingly different courses. In Canada, for instance, electrical energy forms a much smaller proportion of total manufacturing costs than in England. Labour is the big item, and rates for skilled mechanics range from 75 cents (3s. 1d.) to $1.00 (4s. 2d.) per hour. Other grades of labour cost less, but are correspondingly more highly paid than in England. With this condition is also the condition that the same grade of mechanical skill is not available—or cannot economically be availed of—in Canada as in England. This applies particularly to the labour used for manufacturing, maintaining, and repairing electrical industrial equipment—motors, transformers, switchgear, &c.

A little consideration of this will immediately show that refinements of design and manufacture for producing the highest efficiencies (and power factors) are quite unattractive to the Canadian buyer if a less rugged machine results. Ease of repair is more important than superior test characteristics, overload capacity than a lower price, reliability under severe (and what in England might be considered unfair) conditions than a merely safe mechanical design. These very definite requirements have also nothing to do with copying American methods; they are dictated by forces just as compelling as are those that have produced typical British practice to-day.

To illustrate how this has worked, a few examples will be given:—

(*a*) *Wires and Cables.*—The Canadian and American standards in quality of copper, quality of insulation

(rubber), and degree of stranding, are much inferior to British standards. They are, however, adequate for the conditions for which they are intended.

(*b*) *Distribution Transformers.*—These are practically all of the pole mounting type, and are sold at prices below English manufacturers' figures, despite the higher Canadian labour costs. The designs of all makers are almost standardised, and every trimming that can be left off has been eliminated. The sizes used are principally 5 kVA, 7½ kVA, 10 kVA, and 25 kVA. It is actually usually cheaper for an owner to sell for scrap a burnt-out transformer, certainly up to 50 kVA, and even up to 100 kVA frequently, than to endeavour to repair it himself or send it to the manufacturer for re winding. Exactly the same condition applies in the States, although, of course, practice in the very large centres like New York, Chicago, &c., is quite different, due, of course, to the entirely different needs. Such centres do not exist in Canada yet.

(*c*) *Motors.*—The industrial needs of Canada have resulted in motors being manufactured and used, which are lower in efficiency and power factor than good English practice will tolerate. Their pulley shafts are larger and longer, their starting torques are greater with consequent greater overload capacity. The air gaps are longer, the stator slots are open (except in small sizes), and squirrel cage machines are used in the ratio of probably 20 for each slip-ring machine. The resultant Canadian and American machine does stand up to the much severer conditions without trouble than do most British motors in Canada, and to-day there are many users in Canada who, after having tried English motors for three or four years, have gone back to the Canadian and American motors at higher prices with poorer technical performances on account of the lack of general ruggedness of some English machines, and because of the difficulty of repair. The only way in which the British manufacturer can compete is to produce equipment just as well able to meet Canadian conditions as the Canadian and American manufactured articles do. Conditions cannot be changed; practice will improve in time, but the process is slow and only evolutionary.

(*d*) *Switchgear and Control Apparatus.*—This class of equipment, as developed in England, is, with very few exceptions, absolutely unsuited for Canadian use, and the Americans have developed motor control apparatus that is cheaper, better and simpler for industrial use than anything produced in England. The policy of switching squirrel cage motors across the line is developing in both the U.S. and Canada. Push button contactor type switches are available, which give proper protection and complete safety at much less than the cost of English manual auto-transformer starters. Even American push button type auto-transformer starters frequently cost less than English manual starters. It is admitted that the English apparatus is generally of a very high grade, but actually the writer is quite unable to see any economic justification for the large amount of copper, iron and oil commonly found in English starters.

English manufacturers of oil circuit breakers generally speaking, over-rate the interrupting capacities and offer such equipment with stated and guaranteed ratings far in excess of what have been proved the abilities of the switchgear in service in Canada. The explanation offered for this is that English systems are far more safely installed (all underground instead of overhead), very completely protected and more carefully watched than is possible in Canada. The result is that serious faults only very occasionally occur, so that the equipment is very occasionally—if at all—called upon to render the service that it is rated at or designed for. The failures that sometimes do happen when a really bad fault comes on are then ascribed to some very unusual and exceptional condition.

In Canada, this is not the case and most circuit breakers and allied apparatus are called on fairly frequently to meet their full duty, as overhead lines frequently fall and short circuits are common on nearly all systems.

Four of the principal lines of electrical apparatus have been enumerated; they constitute some of the major types of electrical apparatus which Great Britain is able to furnish competitively in Canada, and the reason that very large incursions into the Canadian market have not been made, is the very general failure of manufacturers to ascertain what are the requirements of Canada from an economic and industrial (*not* an ideal) point of view, and properly to realise their true significance in respect to actual equipment design.

The Canadian buyer is becoming disappointed with English equipment in many cases—nevertheless, apart from some American owned industries, there has been—and still is among many buyers—a distinct policy to buy British equipment in preference to American if the former is available.

Some British manufacturers do not take proper care to test thoroughly apparatus shipped to Canada.

The Chicago Underwriters are admittedly anti-British but they no longer exercise (and have not exercised for some years) any control over apparatus used. The various provinces have established their own respective inspecting and testing bureaux, which have official status and are independent of any American control. The writer, for years, has never had the least difficulty in obtaining approval of British equipment of a very wide range and of many manufacturers.

To sum up, the Canadian market is available for, and receptive to, British manufactured electrical equipment, and whilst competition with America is much keener than probably anywhere else in the world, due to the proximity of the United States manufacturers, nevertheless British exports to Canada can be very largely increased by a more careful study and appreciation of the actual requirements, and the adaptation of British manufactures thereto.

II.—The Influence of the Chicago Underwriters.

(By a Canadian Correspondent.)

CANADA'S proximity to the United States, with a population some twelve times as great as her own, is responsible for the fact that certain difficulties confront British manufacturers wishing to trade here which are not met with in other parts of the Empire.

One of these, which affects electrical manufacturers particularly, is the domination which the Underwriters' Laboratories of Chicago hold over the Canadian market.

This situation has been discussed several times within the past few months by various technical journals both in Canada and England but some further comment on it may not be amiss.

Figures have been quoted in connection with the discussion referred to, showing the enormous preponderance of Canada's imports of electrical goods from the United States as compared with those from Great Britain. It must not be supposed, however, that, great as may be the influence of the Underwriters' Laboratories in preventing the British manufacturer from selling his products in Canada, that body is responsible for the whole or, necessarily, even the greater part, of the discrepancy between the value of the U.S. and British electrical exports to Canada.

Generally it may be stated that the Underwriters' Laboratories' approval of electrical equipment covers only such materials, apparatus and devices as are in common use in ordinary installations, *e.g.*, wire, conduit, small porcelain insulators and tubes, lamp-holders, the smaller sizes of motors, electric heaters,

domestic electrical appliances and devices, including electric cooking-ranges, &c. Large motors and generators, transformers, switchgear &c., and even incandescent lamps do not come within the purview of the Laboratories. If the value of the latter imported into Canada from the United States be subtracted from the value of the total electrical imports the value of the remaining imports from that country would be appreciably less. This does not make the comparison between Great Britain and the United States, so far as electrical materials are concerned, any less alarming, but it does indicate that the actual influence of the Underwriters' Laboratories of Chicago is not quite so great as it would otherwise appear to be. Furthermore, it is not quite fair to imagine that the Laboratories deliberately plan to keep British, and other countries', manufactures out of Canada—they arrange their rules and specifications to suit United States conditions; Canada is a neighbouring country and of much less account so far as population is concerned, with a great deal of her property insured against fire with United States' companies. Naturally enough, therefore, the Underwriters' Laboratories' standards were made to apply in Canada, and Canadians, finding a ready-made set of rules—the National Electrical Code—and ready-made specifications of the Underwriters' Laboratories, available for their use, adopted them without question, as, in the main, they suited Canadian conditions quite well; moreover, due to American aggressiveness, and perhaps to laxity on the part of British manufacturers, the electrical apparatus, fittings, materials, &c., available to the Canadian buyer were preponderatingly of United States origin.

The present situation has, apparently, arisen gradually from the causes outlined above, probably without anyone definitely foreseeing what the result would be, but the electrical interests of the United States realising, in recent years, what a trump card they hold in regard to their activities in Canada, now play it to the best advantage. British electrical manufacturers have, somewhat tardily, begun to recognise what this situation means to them. Unless they are prepared to turn out products, for the Canadian market, which conform absolutely to the Underwriters' specifications their products will not be approved in Chicago, the Canadian Fire Underwriters' Association will not accept, at standard rates, risks on buildings in which they are installed and Canadians will be loath to use them, as they will not care to run the risk of having to pay higher premiums, or of losing their insurance in case of fire should they install some unapproved materials or apparatus without the knowledge of the insurance company.

It is not only the British manufacturer who feels aggrieved at the fact that electrical goods for sale in Canada need to be approved in a foreign country, but the most important Canadian electrical manufacturers and several organisations and individuals interested in electrical matters object most strongly to the situation which exists. It is owing to this attitude here that, some three years ago, the Canadian Engineering Standards Association took definite action in the matter of formulating a "Canadian Electrical Code" or book of rules and regulations covering electrical installation work as the first step towards emancipating Canada, as far as possible, from the double yoke of the National Electrical Code (of the United States) and the approval of the Underwriters' Laboratories of Chicago.

The Canadian Engineering Standards Association created a strong, representative Committee to deal with the proposed Code and later engaged the services of two men for several months to compile the "Canadian Electrical Code," also, Sub-Committees were formed in most of the provinces, and the first draft of the Code has been under consideration by both Main and Sub-Committees for some time, although, owing to some divergence of views the matter has been delayed considerably. It is believed, however, that there is at present renewed activity and that the first draft is now under review—largely in order to bring it more into line with the National Electrical Code which has just undergone its usual biennial revision. It should be remarked here that Canada and the United States must, inevitably, always have many standards in common and for that reason it is not, in numerous instances, feasible for the latter to depart very far from the rules and regulations and standards adopted by the former.

The next step in the plans of the Canadian Engineering Standards Association is believed to be the preparation of specifications for electrical material, apparatus and devices on lines similar to those adopted by the Hydro-Electric Power Commission and the Underwriters' Laboratories, and when this work is completed there is little doubt that it will result in the establishment of a Canadian Laboratory where approval of electrical goods can be obtained.

Many readers of the REVIEW will have learnt from its columns that Ontario already has its own rules and regulations, its own specifications, and its own electrical testing laboratories, and that approval can be obtained, for Ontario, independently of the Underwriters' Laboratories. The influence of the United States on the situation in Ontario is, however, very strong since the market provided by this one province is, relatively, so small. If the conditions in Ontario were extended to cover the whole Dominion, as the Canadian Engineering Standards Association so much desires, matters would be greatly improved, and the way of the British manufacturer would be less hard.

The "Underwriters' Laboratories of Chicago, Incorporated," an organisation created in 1901, has grown greatly during the intervening years. According to a recent article in the *Electragist* by Mr. Dana Pierce, the president, its technical work is conducted by the following departments:—Protection, Hydraulic, Electrical, Gases and Oils, Chemicals, Casualty and Burglary Protection. A list of the extremely numerous classes of materials, apparatus and equipment tested would be a very long one. Mr. Pierce states that "for the laboratories' purpose a standard is limited to items affecting safety and good practice as regards fire hazards and accident hazards." This, however, is not in all cases strictly true, as it is known that there are instances in which the specifications contain clauses which cannot strictly be held to affect either safety or good practice—this is no hardship to the American manufacturer who has already designed his product and arranged his tools, &c., so that the underwriters' specification will be complied with, but it has the effect of keeping out of the United States market and also, at present, out of the greater part of the Canadian market, perfectly good and safe electrical goods of foreign manufacture which, except for such entirely unnecessary and irksome restrictions, would undoubtedly receive the Underwriters' Laboratories' approval. As a matter of fact, the result of this situation is that many articles, of superior workmanship, at least as safe, and of much better appearance than those of American manufacture, which are readily obtainable in Europe, are not available over here.

"Underwriters' Laboratories of Canada" was formed in 1920 under a Dominion Government charter, and although no actual laboratory is in existence yet, there are rumours that it is intended to establish one before very long, and if this is done, it will make the United States influence in Canada all the stronger and still more difficult to counteract than under existing conditions.

The Underwriters' Laboratories are not the only factor at work in Canada tending to draw this country more and more closely to the United States in matters electrical. The Western Association of Electrical Inspectors has recently changed its name to "International Association of Electrical Inspectors (Western Section)," and now operates internationally in the two countries. The Association of Electragists (International) is similarly constituted. The American Institute of Electrical Engineers has branches in various

parts of Canada, some of them (*e.g.*, that in Toronto) are very active and doing useful work, while the I.E.E. still remains unknown. The *Electrical World* and other U.S.A. technical electrical journals have a great influence in keeping United States' electrical manufacturers and their products and all developments in electrical matters prominently before those interested in such matters, and even the Canadian papers must to a considerable extent follow suit on account of the great similarity between Canadian and United States practice, while British manufacturers, British products, and the British electrical Press are of relatively little importance.

With such numerous and powerful influences at work, the British manufacturer has indeed a hard task before him if he wishes to make headway, but several firms have done it through determination, hard work, and perseverance, so doubtless it can be done by others, through co-operation, especially, rather than by independent action. Last year some aggressive spade work was done in Canada by one British firm which may have far-reaching results; this, combined with the very useful and highly commendable work of the Canadian Engineering Standards Association, as outlined above, will undoubtedly tend to minimise the overwhelming domination of United States influences if properly followed up, though it would seem that this domination will be large for many years to come.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Trade Union Bill.

The text of the Government's Trade Disputes and Trade Unions Bill was published this week. The main points are as follows:—Strikes with objects outside a trade dispute or directed against the community are declared illegal and punishable. Members of unions refusing to take part in such strikes cannot be expelled. Picketing and intimidation are defined and penalties are prescribed. The political levy is subject to a member's consent and not his refusal as at present. Civil servants are prohibited from joining "outside" trade unions or becoming affiliated to "outside" associations of trade unions. Local authorities are prohibited from making membership of a trade union a condition of employment. The Attorney-General is empowered to apply for an injunction to restrain unions from using their funds in contravention of the provisions of the Bill. The Bill does not apply to Northern Ireland.

The E.D.A.-E.L.M.A. Campaign.

During the last few weeks the organisers have been overwhelmed with ballot papers. The accompanying illustration

The Ballot—A Last-minute Rush.

shows a portion only of one day's haul. On the day in question—March 31st—over 30,000 papers were received.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during February last, were valued at £31,439, as compared with £38,715 in February, 1926. The imports during the first two months of the present year are returned at £72,373, as against £91,122 in the corresponding period of last year.

Church Lighting.

The accompanying illustration is a night view of St. John's Church, Great Clacton, which has recently been equipped with electric lighting. To obtain the successful result the fittings are concealed at the bases of the windows in such a way that the light radiates from the windows, giving a daylight effect; the wiring and fittings cannot be seen. There are six win-

St. John's Church, Great Clacton.

dows and the lamps (60-W gasfilled) are installed in groups of four in silvered glass reflectors. The chancel is lighted by six silvered glass reflectors with 100-W gasfilled lamps. The Callender wiring system was employed, and the installation was designed and carried out by Mr. F. Allum (Clacton manager for Mr. Arthur Cozens).

The Free State Radio Apparatus Duty.

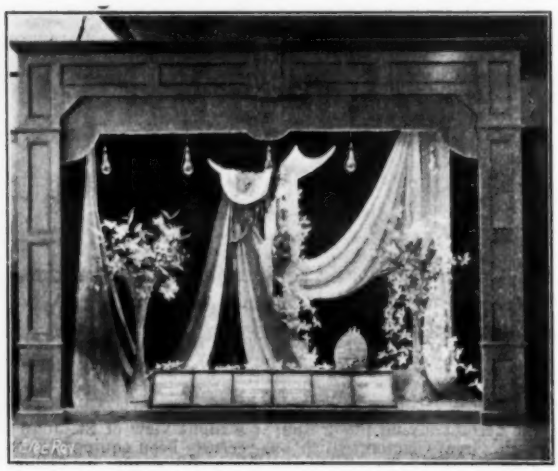
In a statement to the Minister of Finance, Mr. James Kitchen, secretary of the recently-formed Irish Free State Joint Wireless Committee, says that in January, 1926, before the imposition of the duty upon imported radio apparatus, the value of imports of such goods was £22,099; in January, 1927, the value was only £3,387. The increase in prices due to the duty is said to be restricting the growth of broadcasting. The potential market is not big enough for the establishment of a home radio manufacturing industry, and therefore a protective tax is not needed. It is considered that the increased revenue from licence fees which would follow the abolition of the duty would more than compensate the Government for loss of revenue. The duty has been the cause of the closing down of a number of wireless retailers' businesses, it is stated.

"Magnet" Industrial Cooking Equipment.

The General Electric Co., Ltd., informs us that important establishments in different parts of the country have been equipped with "Magnet" industrial cooking equipment. Among them are Messrs. Bryant & May's factory at Bow; Messrs. Gestetner's factory at Tottenham Hale; Marylebone Station (G.C.R.); Maison Lyons (Oxford Street); the Regent Street Polytechnic; the Royal Academy of Music; Unity House (National Association of Railwaymen); Bucks. County Mental Hospital, Aylesbury; the Birmingham Infirmary; Messrs. W. D. & H. O. Wills's factory, Bristol; the Belfast Municipal College; and the County Borough Municipal College, West Ham.

Model Shop-Window Lighting.

The nicely-arranged shop window seen in the accompanying illustration formed part of a display arranged by the London Lighting Service Bureau at the recent Drapers' Exhibition at the Agricultural Hall, Islington. The window was a full-sized one. At first glance there seems to be something wrong; those naked lamps are not in accordance with the best practice. This, however, was part of the scheme—the horrible example which was first demonstrated before staging the



A Shop-Window Lighting Demonstration.

correct methods. Copious lighting equipment operated by a sign-type flasher was installed, bringing into play various combinations. Apart from the use of glaring lights, the window showed the effects of complementary banks of colour, and the application of floodlighting and spotlighting. During the exhibition brief lectures were given by members of the Bureau's staff.

Social Events.

On March 11th the staff of the Wiring Supplies Department of the British Thomson-Houston Co., Ltd., held a dinner at the Union Helvetia Club, W.1, the main object of which was to welcome the manager of the department, Mr. J. N. Stephens, on his return after a long illness. The dinner was attended by a large gathering of the staff, and among those present were Mr. R. A. Lower, the assistant manager, and other leading members of the department. The chair was taken by Mr. W. Millner, B.Sc., of the lighting engineers' section, who made a brief speech of welcome. Mr. Stephens, in his reply, expressed his pleasure in being present, and hoped that, in future, a staff dinner would be arranged annually. After dinner there was a concert, contributed to by members of the staff, and a dance.

A Siemens social and dance was held at Slater's, Leadenhall Street, E.C., on April 1st. About 200 people attended, and music for the dancing and community singing was provided by the Bohemians' Dance Band. Messrs. C. Hughes and W. G. Izant acted as M.C.'s.

New Australian Company.

Airzone, Ltd., has recently been formed in Sydney, N.S.W., with a capital of £10,000 to acquire an existing business of radio, electrical and mechanical engineers.

Australian Duty on Valves Deferred.

According to the *Board of Trade Journal*, the Commonwealth Government has further postponed the date of operation of the increased import duties on valves for wireless telegraphy and telephony until July 1st.

Catalogues for Honduras.

Commerce Reports states that the Honduras Government has decided to inaugurate a general information bureau for the benefit of both merchants and agriculturalists in Honduras. It is proposed to maintain a complete file of catalogues of products from different countries, and at present catalogues of electrical products are desired. They should be forwarded to Señor Ingeniero don M. R. Moncada, Ministro de Fomento, Obras Publicas, Agricultura y Trabajo, Oficina de Informacion, Tegucigalpa, Honduras.

The Luxemburg Concession.

According to the Luxemburg correspondent of a Frankfort newspaper, as the Rhenish-Westphalian Electricity Works Company has given up its idea of competing for the concession for the electrification of Luxemburg, there only remain two offers before the country, those of the Belgian Centrales Electriques des Flandres and the Armstrong, Whitworth Co. The Council of State is said to have expressed itself against the English offer on the ground of the suggested gas concession, the gold currency tariff, the State guarantee for an annuity of over 22,000,000 fr., the lack of a coal and blast furnace basis, the use of English materials, &c. On the other hand preference is stated to be given to a scheme for co-operation between the Belgian company with the Luxemburg iron and steel industry. The project, it is added, will shortly be laid before the Legislative Chamber.

New Italian Company.

A company has lately been formed in Milan with the title La Compania Internazionale per Impianti Elettrolitica to acquire and exploit the patents of the International Electrolytic Patents Co., Ltd., in Italy, Austria, Bulgaria, Czecho-Slovakia, Greece, Jugo-Slavia, and Hungary. It is stated that contracts for a number of installations for the electrolytic production of hydrogen and oxygen have already been obtained.

A French-Belgian-Polish Undertaking.

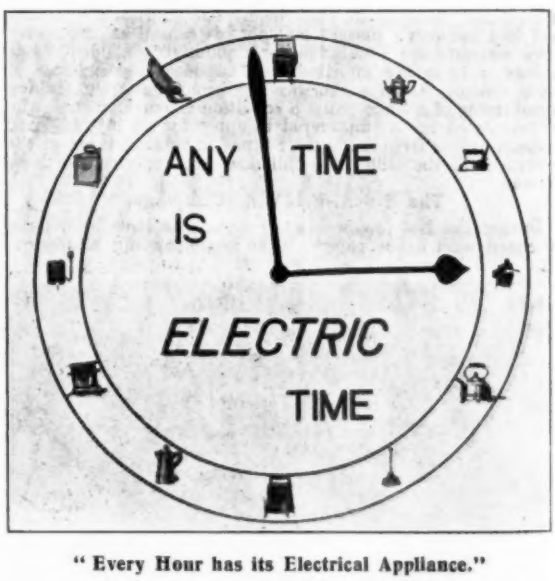
A company is being formed in Brussels with the title Le Trust Métallurgique Belge-Francais, to amalgamate the principal electric power and tramway undertakings in Poland, including the following: Le Centrale Electrique du Bassin de Dombrowa; la Centrale Electrique du Bassin de Cracovie; les Chemins de fer Electriques Suburbains; and les Chemins de fer Electriques du Bassin de Dombrowa.

The G.E.C. at a Co-operative Exhibition.

The Prince of Wales spent some time during his visit to the Co-operative Exhibition in the old Royal Dockyard at Woolwich in inquiries as to the electrical features installed in the model bungalow by the General Electric Co., Ltd. In the entrance hall a "Magnet" electric fire had been installed, but the Prince's greatest interest was in the kitchen, where he closely examined the "Electric Wizard" which was on view. The Prince plied the attendants with questions as to the details of these electrical appliances, and expressed satisfaction as to their utility.

The "All-Electric" Day.

The photograph shows one of the many arrangements adopted by the Blackburn electrical engineer (Mr. P. P. Wheel-



"Every Hour has its Electrical Appliance."

wright) for the purpose of popularising the showrooms in Darwen Street. The huge clock moves and the hours are indicated by appropriate electrical apparatus.

A French View of the South African Market.

The French Commercial Attaché in the Union of South Africa calls attention to the large consumption of all kinds of electric household appliances in South Africa. Demand, he says, is increasing daily and is at present met principally by Germany and the United States. All the big ironmongers sell these goods retail; they do not order them direct but from the import houses where ample stocks are kept. These houses are usually the exclusive agencies of a European or American factory and either work on a consignment basis or actually buy the goods. The best method of gaining a footing on the market is to have a capable and reliable agent in whose hands a small stock should be placed on consignment.

Irish Contractors and the Government Electricity Bill.

We have already made reference to the Bill which the Irish Free State Government has drawn up, giving it the control of practically the whole of the electricity supply business in the Free State. Last week the Irish Section of the Electrical Contractors' Association issued a temperately-worded manifesto urging the Dail (the equivalent of our House of Commons) to support amendments which it was proposing to Sections 47 and 48 of the Bill which empower the State or local authorities to maintain showrooms and sell installations, fittings, and apparatus. The contractors point to the valuable work which they have already done in the interests of the industry and claim that the best results will be obtained if they are allowed to proceed unhampered by State or municipal competition. They point out that in the parallel case of the British Electricity (Supply) Act a clause agreed between the various interests was inserted; their amendments aim at the same idea.

For Sale.

Ilford Corporation Electricity Department has for disposal one 1,000-kW d.c. generating set. Prestwich County Mental Asylum invites offers for one 75-h.p. motor-generator for battery charging, one 460-V balancer, one mains booster, and one 300-kW Browett-Lindley steam balancer, coupled to 260-V generator. (See our advertisement pages to-day.)

Trade Announcements.

MR. P. GARDINER, late of Edison Accumulators, Ltd., has become sales manager to Messrs. A. F. A. Accumulators, Ltd., who have been appointed sole concessionaires in British territory of the D.E.A.C. nickel steel alkaline accumulators.

MR. A. B. GODDEN, radio engineer and manufacturer, of Canterbury, has removed his business from 31, Wincheap, to 3, Oaten Hill.

MESSRS. ALLEN, electrical engineers, of Watford, have opened showroom premises at 40, High Street, Bushey.

MR. LIONEL ROBINSON terminated his agreement with Messrs. Henry Wiggin & Co., Ltd., as London manager on March 31st. He is now acting as London consultant for them, and will continue his business at 3, Staple Inn, W.C., from which address he will factor all their nickel and nickel alloy products. Stocks will be carried.

MESSRS. ARTHUR LYON & CO., 82, Fenchurch Street, E.C.3, inform us that they have been appointed sole distributors of the synchronised electric clocks made by Messrs. Gillett and Johnston, Croydon. The department is under the supervision of Mr. A. A. Lyon, late managing director of Arthur Lyon & Wrench, Ltd.

MR. FRANK KNIGHT, electrical engineer, 16 & 18, Rose Street, Wokingham, has opened new showroom premises.

The NORMAND ELECTRICAL CO., LTD., 3, North Side, Clapham Common, S.W.4, has decided to open its Clapham works to public inspection on Wednesday afternoons.

New Catalogues and Lists.

BROOKHIRST SWITCHGEAR, LTD., Northgate Works, Chester.—Folder 194, dealing with the "Brookhirst Junior" solenoid starting panel.

MESSRS. CROMPTON & CO., LTD., Chelmsford.—List No. 81, containing brief notes and illustrations of the various types of generating plant manufactured by the company.

WAGNER ELECTRIC SUPPLIES, LTD., 66, Victoria Street, S.W.1.—Stock List No. 22E, containing particulars and prices of fractional h.p. and other motors, starters, &c. Also a pamphlet giving notes on single-phase repulsion motors.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—April calendar-blotter advertising "Elasta" lamps.

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—A coloured wall sheet advertising "D.P." wireless and portable accumulator batteries.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—April calendar-blotter advertising the company's underground conveying equipment.

MESSRS. BELBIN & BOWDEN, LTD., 3, Finsbury Square, E.C.2.—A series of priced and illustrated pamphlets dealing with lamps, radio valves, irons, kettles, and fires.

HOPKINSON INDUCTION MOTORS, Willesden Lane, North Acton, W.3.—April stock list of single- and three-phase motors

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Catalogue Section H (3) containing fully-illustrated particulars of industrial and commercial electric cooking equipment for hotels, restaurants, bakeries, &c.

MESSRS. MAWDSLEY'S, LTD., Dursley, Gloucestershire.—Two illustrated catalogues containing particulars and prices of the many types of motors and generators made by the company.

Bankruptcy Proceedings.

A. J. GARROD, Whitehorse Place, Wellingborough, manufacturer of radio sets and components.—The first meeting of creditors was held recently at the Official Receiver's offices, Northampton. The statement of affairs showed gross liabilities of £3,219, of which £2,947 was expected to rank, against assets estimated to produce £467, leaving a deficiency of £2,480. Debtor attributed his failure to the calling in of borrowed capital when his wireless experiments were in a critical stage and not quite perfect. It was decided that Mr. P. R. E. Smith should be appointed to act as trustee with a committee of inspection.

L. WINTLE, electrical engineer, 27, Stafford Street, Market Drayton.—Receiving order made March 24th, on a creditor's petition. First meeting, held April 5th, at the Official Receiver's offices, 12, Lonsdale Street, Stoke-on-Trent. Public examination, April 28th, at the Court House, Crewe.

G. C. BARNES (Regent Electrical Works), electrical engineer, 3, Swift Street, Barnsley.—First and final dividend of 2s. 0½d. in the £, payable at the Official Receiver's office, 21, King Street, Wakefield.

H. A. SANDERS, electrical contractor, The Black Cat Restaurant, Chawston, St. Neots.—Last day for proofs for dividend, April 28th. Trustee, Mr. H. Ball, Duke Street, Bedford.

J. R. MARTIN, electrical engineer, 11, Middlesbrough Road, South Bank, York.—Receiving order made March 29th, on debtor's own petition.

M. C. JONES (M. C. Jones & Co.), stockists of wireless parts and accessories, 239, Westgate Road, and 65, Thornton Street, Newcastle-on-Tyne.—Trustee, Mr. W. Brittain, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne, released September 24th.

A. STOCK, electrical and radio engineer, 323, Chapel Street, Salford.—First meeting, April 12th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, May 12th, at the Court House, Salford.

F. H. ARMITAGE, electrical engineer, 9, Occupation Lane, Pudsey.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released March 25th.

Company Liquidations.

CLAREMONT, JOHNSON & CO., LTD., electrical and wireless factors, 4, Union Place, Wells Street, Oxford Street, W.1. The following are the principal creditors herein:—

	£		£
Armorduct Cable Co., Ltd.	233	Finston Mfg. Co. ...	82
Berry's Electric, Ltd. ...	61	Ludenscheider Install Werke	74
Belling & Co.	64	Midland Electric Mfg. Co., Ltd.	82
Bernard & Co.	95	Magnesia-Werke Weissence	95
Credenda Conduits Co., Ltd.	168	National Electric Supplies	81
C.A.S.E.	91	Shrimpton & Sons ...	52
General Electric Co., Ltd.	133	Stella Conduits Co., Ltd.	103
Grothe & Sohne... ...	146	Southgates, Ltd. ...	137
Gottlieb, J. L.	75	Siemens-Schuckertwerke	88
Brownie Wireless Co. ...	79	Three Star Accumulator Co.	116
Krageloh & Co.	235		
London Commercial Electric Co.	146		
Lee, A., & Co.	68		

AUTOCHROME SIGNS (1926), LTD., 12, Gerrard Street, W.—A meeting of creditors was held on March 28th, at the Society of Incorporated Accountants, E.C. The chair was occupied by Mr. C. H. Temple, 5 and 6, King Street, E.C., the liquidator in the voluntary liquidation of the company. The chairman reported that the liabilities were £670, whilst the assets were estimated to realise between £250 and £300. A gentleman who had been associated with the company, and who had found money for it, had intimated that if the voluntary liquidation was confirmed he would find sufficient to enable the whole of the liabilities to be paid in full. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Temple as liquidator.

H. CLOUGH & CO. (BACUP), LTD., Bacup, electrical engineers, &c.—A meeting of creditors was held last week, at the offices of Messrs. F. Hunter, Gregory & Lord, Bacup. Mr. H. Pickup, the liquidator, submitted a statement of affairs which disclosed liabilities of £9,592, and net assets of £619, leaving a deficiency so far as the creditors were concerned of £8,973. As regarded the shareholders there was a deficiency of £11,973. The company was registered in 1919, with a nominal capital of £3,000, all of which had been issued, and was fully paid up. The company had made losses almost from its inception. The creditors confirmed the appointment of the present liquidator. The following are creditors:—

	£		£
Greenwood & Co. ...	237	Mitchell & Co.	22
Bailey & Co.	360	Wright, A.	10
Hunter, Gregory & Lord	34	Irvin & Sellers, Ltd. ...	46
Bacup Corporation ...	20	Keizer, L., & Co., Ltd....	23

THE FOOLPRUFE PATENT ACCUMULATOR CO., LTD., Market Harborough.—The resolution to appoint Mr. G. T. Berry as liquidator has not been proceeded with, but the shareholders have appointed Mr. J. B. Bullivant, of 6, Friar Lane, Leicester, and Mr. G. T. Berry, 32, The Square, Market Harborough, as joint liquidators. The appointment of Mr. Bullivant followed the wish of the largest creditors expressed at a meeting on March 25th. A meeting of creditors will be held on April 11th. Creditors should send particulars of debts, &c., to one of the liquidators by April 20th.

F. J. JONES & SONS, LTD., electrical engineers, Chester.—A meeting of creditors was held last week at Chester, when Mr. J. Dodd, the liquidator of the company, submitted a state-

ment of affairs which disclosed liabilities of £5,212. The net assets were £3,945, leaving a deficiency of £1,267. The company was registered in July, 1922, with a nominal capital of £5,000. Shares to the face value of £3,940 had been allotted, of which £3,839 were issued to the Jones family. The business was for many years carried on by the father of the present directors, and after his death by the executors. The company then took over the business, but no cash consideration was paid. During 1925 the turnover was in the neighbourhood of £14,000, and there was a net loss of £239. Down to the end of October last the sales exceeded £14,000, and there was a loss of more than £1,000. Debentures were issued in July, 1925, the consideration being the guarantee of the bank overdraft. A resolution was passed confirming the voluntary liquidation of the company, subject to Mr. F. Lloyd Williams, C.A., Liverpool, being appointed to act as joint liquidator with Mr. Dodd, whilst a committee was also appointed consisting of the representatives of Electric Lamp Factors, Ltd., Callender's Cable & Construction Co., Ltd., Hollingdrake & Sons, Ltd., Crossley Bros., Ltd., and the General Electric Co., Ltd. It was stated that there was reason to hope that the business would be sold on advantageous terms as a going concern. The principal creditors are:—

	£		£
Elec. Lamp Factors, Ltd.	865	Crossley Bros., Ltd. ...	355
Callender's Cable & Construction Co., Ltd. ...	590	General Electric Co., Ltd.	271
Hollingdrake & Sons, Ltd.	469	Lister & Co.	160
		Tudor & Co.	158

RE-ECHO RADIO CO., LTD., late 109, Marsham Street, Horseferry Road, S.W.1, radio manufacturers.—A further dividend of 9d. in the £ has been declared, and it is stated that there is an option for three months to purchase the registered trade mark, name, &c., of the company, and should this mature, it will be possible to pay another small dividend.

GOSWELL ENGINEERING CO., LTD.—Winding up voluntarily. Liquidator, Mr. R. G. Pye, 6, Martin Lane, E.C. A meeting of creditors was held at 95-98, White Lion Street, N., on April 6th.

MARINE & MECHANICAL ELECTRIC WELDING CO., LTD., AND MARINE & MECHANICAL ELECTRIC WELDING CO. (CARDIFF), LTD.—Meetings of members are called for May 2nd, at 146, Bishopsgate, E.C., to hear an account of the winding up from the Liquidator, Mr. L. C. F. Robson.

ELECTRICAL STORES (NOTTINGHAM), LTD.—A meeting of members is called for April 28th at the offices of Messrs. Leman, Hill & Hilton, 1, St. Peter's Church Walk, Nottingham, to hear an account of the winding up from the Liquidator, Mr. S. H. Hill.

KINGSWAY RADIO, LTD.—Winding up voluntarily. Liquidator, Mr. W. C. Todd, 3, Cannon Street, E.C. Meeting of creditors, April 12th, at the Institute of Chartered Accountants, Moorgate Place, E.C. Particulars of claims to the liquidator by May 2nd.

Private Arrangements.

F. F. C. KING, wireless dealer, 1, Botley Road, 87, St. Aldate's, and 32, West Street, Oxford.—A meeting of creditors was held recently, when a statement of affairs was presented which showed ranking liabilities of £1,627, of which £1,277 was due to unsecured creditors and £350 to the bank, partly secured. Net assets were £1,221, leaving a deficiency of £406. The present position was attributed to lack of capital. The creditors passed a resolution confirming the deed of assignment already executed, and the trustee was authorised to carry on the business with a view to its sale as a going concern. The following are creditors:—

	£		£
Burndept Wireless Co. ...	110	Johnson & Co., R. J. ...	24
Cleartron Radio, Ltd. ...	20	Kingerlee, T. H., & Sons	23
Cooper, G. R., Ltd. ...	21	Metro-Vick Supplies, Ltd.	40
De la Mare	55	Richardson, W. B. ...	57
General Electric Co., Ltd.	20	Wratton, J.	110
Hayward, C., & Son ...	36	Ewers, C. (Exors.) ...	127
Houghton-Butcher, Ltd.	54	Stroud, P. W.	116
Hughes, A., & Co. ...	53	Langmore, G.	20

Dissolutions of Partnership.

PARTRIDGE & WILSON, electrical and radio engineers, 217a, Loughborough Road, Leicester.—Mr. C. A. F. Partridge and Mr. H. G. A. R. Wilson have dissolved partnership. Mr. Wilson will attend to debts and continue the business under the same style.

PEARN & CARSON, electrical and mechanical engineers, Sherwell Lane, and 27, Tavistock Road, Plymouth.—Messrs. J. E. Pearn and A. S Carson have dissolved partnership. Mr. Carson will attend to debts and continue the business.

YORK RADIO SUPPLIES, vendors of wireless supplies, Coffee Yard, York.—Messrs. S. M. Stevens and C. Shepherd have dissolved partnership.

STONE & NICHOLLS, electrical and radio engineers, 7, Locket Road, Wealdstone.—Mr. G. H. Stone and Mr. C. J. Nicholls have dissolved partnership. Mr. Stone will attend to debts and continue the business.

HOLT & Co., wireless engineers, &c., 7, Garden Street, St. Annes-on-the-Sea.—Mr. S. I. Holt and Mr. G. W. Hammett have dissolved partnership.

MUTCH & FARQUHARSON, motor and electrical engineers, 367, King Street, and Seaforth Road, Aberdeen.—Mr. J. G. Mutch and Mr. C. V. J. Farquharson have dissolved partnership. Mr. Mutch will attend to debts and continue the business in his own name at the old address. Mr. Farquharson will carry on business in his own name at 36, Gordon Street, Aberdeen.

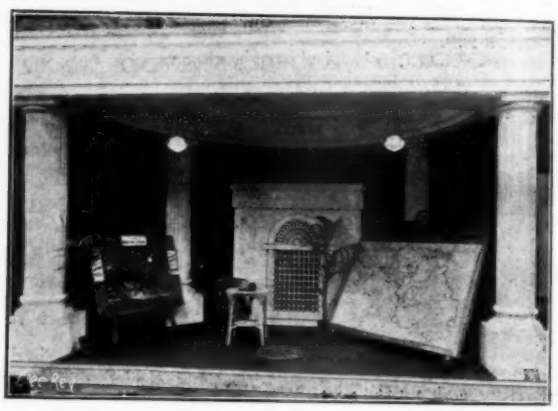
PHILPOT & SON, electrical engineers, 3, St. George Street, Canterbury.—Mr. D. McKellar and Mr. R. M. Pudney have dissolved partnership. Mr. D. McKellar will attend to debts and continue the business under the same style.

Frozen Time Switches Still Work.

VENNER TIME SWITCHES, LTD., has received from the cable ship *Lord Kelvin* photographs of a buoy bearing lamps controlled by "Venner" time switches. The lamps were frozen into a solid block of ice after the buoy had been at sea for five days in a heavy gale. The buoy was then brought aboard the ship after the top of the staff had been broken by the weight of ice. A letter states: "The steel sleeve which extended from above the cross trees to the top of the buoy prevented the lower part of the staff from breaking off, and thus saved the lamps intact, the clocks, &c., being in perfect condition, ticking away as usual."

The Shropshire Power Co. at the Fair.

In our notes on the British Industries Fair, Birmingham, we made mention of the very effective display arranged by the Shropshire, Worcestershire and Staffordshire Electric Power Co. The view reproduced herewith gives a better idea of the stand, which was only one phase of the company's tireless activities. With the photograph we received a little booklet which the company is distributing. This is a consumer's *vade mecum*, telling him how to read a meter; how electricity is generated and distributed; how to obtain a supply; how to get premises wired; how to replace fuses and effect minor switch repairs; and what one unit of electricity will do. It is one of the best efforts of its kind that we have seen.



The Shropshire Power Co.'s Stand at Birmingham.

Major Segrave's Record.

Although a great deal regarding Major Segrave's speed record has appeared in the daily Press, we are compelled to refer to it, for the 1,000-h.p. "Sunbeam" in which the record was accomplished was fitted with B.T.-H. magnetos. We are also informed that the bearings of the car were made by the Ransome & Marles Bearing Co., Ltd.

Messrs. Vickers, Ltd., state that their steels were used in all the vital parts of the car.

Local Exhibitions.

CARMARTHEN.—A domestic electrical exhibition was held last week at St. David's Memorial Hall. The organisers were the Carmarthen Electric Supply Co., Ltd., and they secured the assistance of the staffs of local electrical contractors—Messrs. Chapman & Sons, A. H. Stoodley, and I. Davies. The opening ceremony was performed by the Mayor (Ald. W. Spurrell) and he was supported by the chairman (Mr. J. B. Arthur) and other officials of the Supply Co. Mr. Arthur, on behalf of the company, presented an ultra-violet ray apparatus to the County Infirmary, and was thanked by the Mayor. The exhibition was arranged in the form of rooms, each section being equipped in a thorough manner with the appropriate appliances. Cooking demonstrations were given in an adjoining hall. No fewer than 40 firms sent goods for exhibition. The company has an attractive tariff for domestic supply, namely, 1½d. per kWh all the year round.

BATTERSEA.—Under the auspices of the Borough Electricity Department (engineer: Mr. F. A. Bond) an exhibition of electrical appliances was held recently at the Latchmere Baths. A comprehensive range of appliances was shown and demonstrations were given. As the department has a domestic flate rate of 1d. per kWh, as well as wiring and hiring schemes, electricity should be within the reach of everybody in the borough.

Calendars.

Just when we were waiting for it, the new wall calendar of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., came to hand from Trafford Park. The "Girl" series is continued, but there is a change in the type, and Miss Mona Maris, who acts for the British films, will inspire us and soften some of life's asperities until the end of March, 1928.

BROOKHIRST SWITCHGEAR, LTD., has sent us the April, May, and June cards for its 1927 calendar. These, similarly to their predecessors, bear excellent drawings of architectural features of ancient buildings.

Nottingham Contractors' Dinner.

Mr. H. J. Miles, president of the Electrical Contractors' Association, was the principal guest at a dinner of the Nottingham branch, at which Mr. Sidney Farr presided, on April 1st, and, responding to a toast proposed by Mr. H. Talbot, engineer of the Nottingham Corporation Electricity Department, to which Mr. A. D. Phillips, the manager of the Derbyshire and Notts. Electric Power Co., also spoke, he said their endeavour was to get a square deal not only for members of the organisation, but for everybody connected with the industry. He was sometimes asked why, as there were five or six thousand electrical contractors in the country, the Association had only 1,120 members. There were some electrical contractors whom the Association did not want; they claimed that their members were men who understood their work. Mr. Miles said that if all sections worked together harmoniously the Electricity (Supply) Act would lead to the advancement of the electrical industry. Mr. A. D. Phillips said that the success of the industry was dependent upon the capacity of the consumer. The consumer wanted his wiring done cheaply, but he should pay a fair price for what he got. The Association had gone a long way towards establishing principles of fair dealing. Ald. E. Huntsman, chairman of the Nottingham Electricity Committee and of the East Midlands Board, observed that his committee had determined that Nottingham should be supplied with electricity on the most advantageous terms that forethought, wise expenditure, and good management could secure. The committee aimed at getting electricity in all types of houses for all purposes, and desired very close co-operation with the contractors. A conference would have to be arranged to enable them to get together.

Electrical Imports of British Malaya.

The *Board of Trade Journal* reports that the imports of electrical goods and apparatus into British Malaya during 1926 were valued at £493,289, as against £386,492 in 1925—an increase of 27 per cent.

Book Notices.

A feature of the spring number of the M. & C. Apprentices' Magazine is a portrait and sketch of the career of Sir Duncan Watson, who is proudly claimed as an old M. & C. apprentice. An interesting section is that describing, and in many cases illustrating, suggestions for improvements in processes or equipment for which awards have been granted; in this issue some 50 awards are recorded, ranging from 5s. to three guineas, and nearly 150 suggestions are printed, whether adopted or not, the reasons for their rejection in many cases being given.

The first number of the *Kipling Journal* has been received from the hon. secretary of the Kipling Society, Mr. J. H. C. Brooking, The Milestone, Slough. It contains particulars of the origin and formation of the Society, many interesting reminiscences of Kipling's schooldays by his contemporaries, and a list of members.

"Business Simplified; the W.R.C.H. Plan Explained," by Barry W. Bruce. (18 pp.) Manchester: John Heywood, Ltd. Price, 1s. net.—The initials in the title of this pamphlet stand for "Wholesalers' and Retailers' Clearing House." This suggested organisation would deal with the accounts of businesses of all kinds. A retailer would only need to send a cheque covering the whole of his purchases, with a list of suppliers, and the clearing house would do the rest, saving the retailer money in the direction of cheques, postage, &c. The clearing house would also act as a comprehensive trade protection association, &c.

"Applied Magnetism," by T. F. Wall. Pp. 262; 146 figs. London: Ernest Benn, Ltd. Price, 28s. net.

Messrs. Petters, Ltd., have sent us a copy of an official guide to Yeovil (1s.), which has been written and illustrated by their publicity manager (Mr. A. T. Warbis). It is a production of great merit; the sketches of the features of Yeovil and district are particularly good.

German Turbine Syndicate.

A transaction which has just taken place in Germany has disclosed the fact that a syndicate exists for steam turbines in that country. The matter concerns the transfer to the Siemens-Schuckertwerke of the electrical and turbine branches of the Thyssen machinery works of Mulheim. As a result of the latter being in possession of raw material supplies it had been possible, it is said, for the concern to underbid the electrical firms in the prices of turbines by up to 20 per cent. The transfer of these branches to the Berlin firm will thus dispose of a competitor of the turbine syndicate and at the same time strengthen the position of the latter.

The Brush Co-partnership Scheme.

In connection with the co-partnership scheme which was established twelve months ago by the Brush Electrical Engineering Co., Ltd., shares to the value of £8,000 have been distributed among the employés. The average of allotment represents nine shares per employé. Each of the men engaged on weekly terms have received four £1 shares, which at present stand at 26s. 9d., the weekly staff six shares each, and the monthly staff 16 shares each.

The F.B.I. President's Address.

The annual general meeting of the Federation of British Industries was held on March 30th. In his address the retiring president, Sir Max Muspratt, Bt., said that the general strike from being a great catastrophe was converted into a great advertisement of British common sense and patriotism. During that strike and the coal dispute the F.B.I. gave invaluable assistance to its members to enable them to obtain coal from home stocks and overseas. The industry of this country showed unexpected vitality by the way in which it carried on; that could only be explained by the expansion of the home market in various directions. With regard to the future, there was room for optimism, for if so much of our industry could be maintained under last year's serious conditions, it was not unreasonable to expect that portion to continue and to expand. In addition, there was every sign that our export trade would reach a new normal not appreciably worse than our pre-war condition. Sir Max then dealt with the subject of international industrial conferences. The position had been summarised in the statement that the war had impoverished the Old World and enriched the New World, while it had reduced the purchasing power of the Old World and increased its productive power. It was necessary to make an effort to reorganise, to reduce costs, and to avoid excessive competition. By reason of its frequent meetings the Grand Council of the Federation had become a real clearing house of modern industrial thought. The industrialist must now not only understand his own industry, but must understand its relation to other industries, and be acquainted with all social and economic problems.

Recent Contracts.

The MIRRLEES-WATSON CO., LTD., Glasgow, has just received an important order for pumping machinery from the Indian State Railways for the Kalyan electric power station (consulting engineers: Messrs. Merz & McLellan). The contract includes three 27-in. and two 18-in. vertical-spindle type motor-driven centrifugal pumps, these supplying the condensing water required for the generating units; and nine pumps of smaller size for general service purposes. It also includes the water-screening plant of bracket type, the 42-in. circulating mains, and all pipework from the screens to the condenser and back to the river.

Marlborough House, St. James' Park, S.W., is at present being prepared for the occupation of the Prince of Wales. The extensive alterations include the complete re-wiring of the building, for which a contract has been placed by the Office of Works with MESSRS. H. J. CASH & CO., LTD., of Westminster. The steel conduits used throughout are being supplied by the "Perfecta" Seamless Steel Tube and Conduit Co. (1923), Ltd.

The HORSTMANN GEAR CO., LTD., Bath, has secured an order from the Engineering Department of the G.P.O. for 750 service boxes with time switches, and 250 service boxes without time switches, all for use in telephone kiosks. This is an interesting illustration of the growing adoption of automatic clock control for all types of public lighting.

American Radio Apparatus Licences.

The *Telegraph and Telephone Age* states that the Radio Corporation of America has entered into an agreement with the Zenith Radio Corporation, Chicago, one of the largest independent radio manufacturers, under which the Chicago concern is licensed to use the patents held by the Radio Corporation and also by the Westinghouse Electric and Manufacturing Company and the General Electric Company. The Zenith Corporation, the first of the independents to be so licensed, admitted, in the agreement, that the patents were basic and paid a large lump sum covering their use in the past. It is stated that negotiations are under way with several other independent concerns and that in all probability licences will be issued to those concerns. This movement is generally accepted as indicating that the Radio Corporation is soon to become the controlling factor in the radio industry in the United States. The agreement with the Zenith ends negotiations which have been under way since 1922, and also means the dropping of two civil actions against that concern. Numerous infringement suits brought by the Radio Corporation are pending, and if other independents are to be let in it probably will mean an early end of a great deal of litigation.

Price Reduction.

The MULLARD WIRELESS SERVICE CO., LTD., has reduced the price of its "D.U. 10" rectifying valve, which is used in connection with the "Drake" receiver described in No. 9 of "Radio for the Million."

Improved Tube Production.

At last week's meeting of Stewarts & Lloyds, Ltd., the chairman, Mr. A. C. Macdiarmid, said that the company's tube plants were being continuously improved and speeded up; the new mills were in operation and with full work they would be able to meet fair competition from any source. Special efforts were being made, with success, to open up new markets and develop existing ones. Mr. Macdiarmid also refered to the tube works which was being erected in South Africa by the company in co-operation with the United Steel Corporation (of South Africa), Ltd.

A Large Canadian Project.

M. Taschereau, the Premier of the Province of Quebec, has received a cable from the Agent-General for Quebec in London, Dr. Lemieux, stating that four members of a British syndicate, which has schemes in view for the industrial development of the Lake St. John region, involving ultimately a total capital expenditure of £100,000,000, are sailing shortly for Canada. Dr. Lemieux said that the members of the syndicate represent banking, railway, iron and steel, shipping and electrical supply companies.—*Reuter* (Quebec).

A Birthday Souvenir.

We have received from Venner Time Switches, Ltd., a handy blotter as a souvenir of the company's approaching 21st birthday. Its customers are eligible for similar souvenirs.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, &c.		Price April 5th.	Fortnight's inc. or dec.
a Acid, Oxalic	per lb.	8½d.	...
a Ammoniac, Sal	per ton.	£60	...
a Ammonia, Muriate (large crystal)	,,	£62	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£35	...
a Copper Sulphate	,,	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	5½d.	...
a Shellac	per cwt.	£13 10s.	...
a Sulphur, Commercial	,,	£9 10s.	...
a ,, Roll	,,	£9 10s.	...
a Soda, Chlorate	per lb.	2½d to 2¾d.	...
a ,, Crystals	per ton.	£6 to £6 5s.	...
a Sodium Biohromate, casks ...	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots...	per ton.	£107 to £112	...
b ,, Wire	per lb.	1/6 to 2/-	...
b ,, Sheet	,,	1/8 to 2/9	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net.	£272	£2 dec.
Grade II	,, ,,	£189	£1 dec.
Grade III...	,, ,,	£97	£1 dec.
Brass (rolled metal 2' to 12' basis)	per lb.	9¾ d.	¼d. dec.
c ,, Tubes (solid drawn) ...	,,	11½d. to 11¾d.	...
c ,, Wire, basis	,,	9¾ d.	...
c Copper Tubes (solid drawn) ...	,,	1/0½	...
c ,, Bars (best selected) ...	per ton.	£86	...
c ,, Sheet	,,	£86	...
c ,, Rod	,,	£86	...
d ,, (Electrolytic) Bars ...	,,	£63	2/6 dec.
d ,, ,, Sheets ...	,,	£144 10s.	...
d ,, ,, Wire Rods	,,	£73	2/6 dec.
d ,, ,, H.C. Wire	per lb.	9 1/16d.	1/16d. dec.
f Ebonite Rod	,,	2/3 to 2/6	...
f ,, Sheet	,,	2/3 to 2/6	...
n German Silver Wire	,,	2/3	...
h Gutta-percha, fine	,,	8/-	...
h India-rubber, Para fine	,,	1/5½	½d. dec.
i Iron Pig (Cleveland No. 3.) ...	per ton.	122/6	...
i ,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g Lead, English pig	,,	£28 5s.	30/- dec.
g Mercury	per bot.	£21 to £2/	nom.
e Mica (in original cases) small ...	per lb.	3d. to 4/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/3	...
p ,, ,, rolled strip & sheet	,,	1/2½	...
p ,, ,, wire...	,,	1/3½	...
o Platinum	per oz.	£33	...
d Silicium Bronze Wire	per lb.	10¾d.	...
r Steel, Magnet, in bars	,,	7½d.	...
n Tin, Block (English)	per ton.	£308 to £309	£4 10s. dec.
n ,, Wire, Nos. 1 to 16	per lb.	4/9	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd
g James & Shakespeare.
h Edward Hill & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on the lead position on April 2nd, Messrs. James Forster & Co. stated that a distinctly steadier tone had been in evidence. More activity had been shown by the Continent, Germany being reported as buyers. In this country a better demand was experienced, cable makers were buying fair quantities, while the home trade was fully occupied. Arrivals, on the other hand, in March were not excessive, totalling about 20,000 tons. "The stabilisation of the franc, which cannot now be long delayed, would at once stimulate French consumption, and at the same time relieve this market of its surplus lead."

The London Chamber of Commerce.

We have received from this organisation a copy of its report for 1926. The section devoted to the electrical and allied trades records the resignation of its chairman, Mr. S. A. Russell, through ill-health, and the appointment of Mr. P. M. Rossdale as his successor. Mr. A. M. Sillar continues to act as deputy-chairman. A committee appointed to consider the Electricity (Supply) Bill made a number of recommendations in support of amendments which, however, were not carried. The criticisms were that the Central Board was not under any effective control; that the developed areas would have to contribute to the cost of supplying undeveloped areas; and that the interconnection of stations and the construction of an efficient network could be secured by means which were less objectionable than those proposed in the Bill. The section welcomed the steps which had been taken by municipal supply authorities to reach an agreement with contractors upon the subject of municipal trading. The Merchandise Marks Bill also received the general approval of the section.

An Anglo-Italian Conference.

A conference was to take place yesterday and to-day between representatives of the Federation of British Industries and of the General Fascist Confederation of Italian Industries. The list of Italian delegates included On. Antonio Benni, president of the Confederation and of the S.A. Ercole Marelli and the S.A. Magneti Marelli; Gr. Uff. Avv. Rinaldo Panzarasa, president of the Società Idroelettrica Piemonte and the Società Telefoni Interprovinciali Piemonte e Lombardia; and Comm. Dott. Giorgio Pirelli, president of the Italian Chamber of Commerce in London and managing director of the Pirelli-General Cable Works, Ltd. The British representatives included Sir Max Muspratt, Bt.; Col. O. C. Armstrong, D.S.O. (Greenwood & Batley, Ltd.), Mr. D. A. Bremner (British Engineers' Association), and Mr. D. N. Dunlop and Col. R. K. Morcom (British Electrical and Allied Manufacturers' Association).

Lighting and Power Notes.

Birkenhead.—Supply to Wirral.—General contracts for overhead mains, transformers, sub-stations, kiosks, &c., in connection with the Corporation's electricity scheme to the Wirral Peninsula have been let. In about two months' time six or eight sub-stations will probably be erected in different parts of the area.

Brighton.—New Feeder.—At a recent meeting of the Lighting Committee the engineer reported that to deal with the increasing demand for supply in the south-west area of the borough, it would be necessary to lay a new 460-V feeder and make some slight modification to the existing feeder at present supplying that section of the area. The Committee authorised the work to be undertaken at a cost of £5,000.

Canada.—Electrical Development.—The Gatineau Power Company, subsidiary of the Canadian International Paper Company, has acquired two additional hydro-electric power installations in the Ottawa Valley. The first, near East Templeton, Que., is the Bonhomme electrical plant developing 600 h.p. The other is the plant at Papineauville, Que., of the Papineauville Electric Company, with a capacity of about 1,000 h.p. The purchase of these two power plants includes important water rights on the Blanche, Ottawa and Nation Rivers, and the Gatineau Power Company, which already controls the Chelsea, Farmers Rapids and Paugan Falls developments, on the Gatineau River, intends to carry out extensive works for the augmentation of the supply of electrical energy in the districts which may be served by the company.

Cannock.—Termination of Agreement.—The Urban District Council is to give Wolverhampton Corporation twelve months' notice to terminate the agreement under which the Corporation has had control of the commercial and distributing side of the Cannock electricity undertaking during its initial years. The Council's agreement with Wolverhampton for bulk supplies will continue.

Cardiff.—Loan Sanctioned.—The Corporation has received sanction to the borrowing of £110,000 for mains.

Chelmsford.—Supply to Marconi Station.—The Electric Supply Corporation, Ltd., is to give a supply of electricity to the Marconi experimental station, Broomfield Road.

Continental.—Spain.—The Spanish Consul in Gothenburg states that the utilisation of the waterfalls in Spain is one of the general reforms which are proceeding in that country. It is intended to harness about 1,500,000 h.p., and he states that Swedish firms will presumably be allowed to make proposals for the establishment of the works.

Sweden.—The Korsnaes Saagverksaktiebolag has bought from the Avesta ironworks its share in the Knaangedsforsen waterfalls on the Indal River in Lower Norrland, which will be able to develop about 200,000 h.p. when fully exploited.—*Reuter's Trade Service* (Stockholm).

ITALY.—The Società Idroelettrica de l'Alto Timavo is engaged on the construction of an installation for the supply of electricity to the town of Trieste to the extent of 180 million kWh per year. Two hydro-electric stations are being established, one on the River Recca, which will comprise five 15,000-h.p. Pelton-type turbo-generators, and a smaller one one the River Padez, which will have three 1,000-h.p. sets.

Crookhill.—INSTITUTION SUPPLY.—The West Riding County Council has arranged with the Doncaster Collieries Association, Ltd., for the supply of electricity to the Crookhill Hall receiving home on the following terms:—The Association to supply, erect and maintain the necessary line from the Association's Edlington Village sub-station to Crookhill Hall; also supply the necessary transformer for stepping down the pressure from 3,300 V to 110 V for lighting and power; the County Council to make a minimum annual payment of £80 for an annual consumption up to 9,600 kWh, but if the consumption exceeds this amount the payment to be at the rate of 2d. per kWh.

Darlington.—ELECTRICITY SUPPLY.—The Rural District Council has consented to the application of the Town Council for a Special Order to supply electricity to houses in the garden suburb, outside the borough, but has reserved power for the Cleveland & Durham Co. to take over the supply if found convenient. Consent has also been given to the company for the erection of an overhead cable to supply electricity to Middleton St. George.

Eastbourne.—OPPOSITION TO ORDER.—The Corporation has lodged formal objection to the application of the Electric Supply Corporation, Ltd., for a Special Order authorising it to supply electricity in the parish of Hailsham, which is proposed to be included in the Eastbourne area.

Harwich.—LOAN.—The Electricity Committee is to apply for sanction to the borrowing of £5,000 for the following purposes:—Services, £2,000; meters, £1,000; assisted wiring installations, £1,500; domestic apparatus, £500.

Lytham-St. Annes.—LOAN.—Application is being made by the Town Council for sanction to a loan of £31,813 for electricity purposes.

Prestatyn.—ELECTRICITY SUPPLY.—According to the *Manchester Guardian*, at a recent meeting of the Urban District Council it was reported that good progress was being made with the laying of the underground cables and the construction of the sub-station, and that the supply to the district would be available shortly after Easter.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

PRESTON.—Lighting:—In the borough: From 8d. per kWh, less 10 per cent. discount, to 6½d. per kWh, less 5 per cent. discount. In the urban district of Fulwood: From 8d. per kWh, less 10 per cent., to 7d., less 5 per cent. Other districts: From 8d. with no discount, to 7d., less 5 per cent.

SOUTHAMPTON.—The increase of 20 per cent., made owing to the coal dispute, has been removed.

BEDFORD.—Lighting: Flat rate reduced to 6d. per kWh. The temporary increase of 10 per cent. withdrawn.

WINCHESTER.—The temporary increase of 7½ per cent. has been removed.

REIGATE.—Lighting: From 6½d. to 6d. per kWh. Power for commercial purposes: From 2d. to 1½d. per kWh.

ERITH.—Domestic purposes other than lighting or power: From 2d. to 1d. per kWh. Power (except supplies given under power agreements): From 3d. to 2d. per kWh.

Reigate.—LOAN.—The Town Council is applying for sanction to a loan of £24,000 for the installation of new plant at the electricity works.

Rochdale.—SUPPLY FOR INSTITUTION.—The Board of Guardians has decided to expend a sum of £3,500 on removing existing plant, and installing new plant to enable electricity from the Corporation's mains to be used at Birch Hill Institution.

Seaham Harbour.—ELECTRICITY SCHEME.—The Urban District Council has accepted a revised tender of Messrs. Gray Bros. (Newcastle), Ltd., amounting to £15,468, in connection with the electricity scheme for the district, being an increase of £259, and application is to be made for the proposed loan to be revised accordingly.

Scarborough.—REVISED ELECTRICITY CHARGES.—The Electricity Committee has recommended to the Town Council the adoption of a flat rate of 6½d. per kWh for electricity for lighting, with a discount of 5 per cent. for prompt payment of accounts. Flat rates of 1½d. per kWh for heating and cooking and 2½d. per kWh, less 5 per cent., for power are also proposed. There is a graded scale of special contract rates for power consumers who take between 10,000 and 100,000 kWh per annum.

Shrewsbury.—INAUGURATION OF NEW PLANT.—A new 600-h.p. Diesel engine, coupled to a 400-kW generator, was formally set in motion by the chairman of the Electricity Committee on March 28th. The cost of the extension was £15,000.

Taf Fechan.—RAILWAY STATION SUPPLY.—At a recent meeting of the Water Board the Great Western Railway Co. inquired whether the Board would be in a position to give an electricity supply from its generating station for lighting Pontsticill station, the stationmaster's house and sidings at either end of the platform. The question as to whether a supply might be afforded to the village of Pontsticill was also raised. Consideration of the matter was deferred.

Uckfield.—RESCISSION OF ORDER.—The Rural District has decided to request the Electricity Commissioners to rescind the powers granted to the Crowborough District Gas & Electricity Co. for the supply of electricity in Rotherfield and Mayfield, on the grounds that the company has taken no steps up to the present to give a supply, and in view of the company's supplying gas, the Council is of opinion that it has less inducement to supply electricity than the Weald Electricity Supply Co., Ltd. If the Commissioners are not prepared to rescind the powers at present, the Council proposes that if the company fails to give a supply in these areas within the next two years, the Commissioners should transfer the powers to the Weald Company.

ACQUISITION OF GAS STOCK.—The *Sussex Daily News* reports that the Electric Supply Corporation, Ltd., has acquired practically the whole gas stock of the Uckfield Gas & Electricity Co.

United States.—ELECTRICAL DEVELOPMENT.—Work will be commenced shortly on a sub-station which the Public Service Electric & Gas Company has planned for the Marion generating station at Jersey City, N.J. According to the *Electrical World* it will cost approximately $3,000,000 and will be called the Hudson switching station. It will be the third of a new type of station to be built by the company, the others being at Trenton and Athenia, near Passaic. The Hudson station will distribute electricity generated at the Essex, Kearny and Marion stations so as to take care of the growing demands of Jersey City, Union City, Hoboken, Hackensack, Bayonne, Rutherford, Englewood, Edgewater, Leonia and other municipalities in Hudson and Bergen Counties. The portion of the station to be completed this year will represent a capacity of 126,000 kW. The ultimate capacity is designed to be 216,000 kW. The station will contain six 85-ton transformers furnished by the General Electric Company. The first part of the station is scheduled to go into operation by October 1st.

Work has commenced on the foundations of Debray No. 3 power station of the Detroit Edison Co., the initial installation of which will include two 50,000-kW turbo-generators. The plant will be put into commission in 1928, and the cost is estimated at $9,500,000. A sixth unit is also to be installed at the company's Trenton Channel station, which will raise the plant capacity to 300,000 kW. At the Marysville station a 30,000-kW set is to be installed which will increase the rating of the station to 110,000 kW. It is anticipated that the company will spend $32,000,000 on construction work during the current year.

Walsall.—SUPPLY TO HOUSING ESTATE.—Plans for mains to supply 666 houses to be erected by the Corporation on the Ide Road and Four Crosses housing sites have been approved, the estimated cost being £8,000.

Walton-on-Naze.—ELECTRICITY IN BULK.—The Electricity Committee has submitted a report to the Urban District Council regarding the conference with Clacton Town Council in connection with the proposed bulk supply of electricity to Walton. The Clacton borough electrical engineer proposes the erection of a sub-station near Frinton railway gates, the cost of laying the cable from the sub-station to Walton to be borne by the Urban Council, and the cost of the cable from Clacton to the sub-station to be borne by the Clacton Council, which has already applied for the necessary Order. It is anticipated that a bulk supply will be available within one year from the granting of the Order.

West Ham.—LOAN.—The Town Council has applied for sanction to a loan of £83,280 for mains, services, transformers, feeders, sub-stations, and wiring installations.

Wirral.—INSTITUTION SUPPLY.—Whether it would be cheaper for the Board of Guardians to generate its own electricity for the Clatterbridge Institution or to obtain a supply from the Birkenhead Corporation was considered at a recent meeting. Mr. Lloyd Barnes, consulting engineer, advised that it would not be a wise policy to take a supply from the Birkenhead Corporation at the present rates. If the Corporation offered electricity at 1.2d. per kWh the Guardians should accept. A Committee was appointed to meet the Birkenhead Corporation.

West-Midland Electricity District.—INQUIRY.—A public inquiry was to be opened at Iron Bridge Police Station on Wednesday last relating to the proposed erection of a super-power station at Buildwas.

Wrexham.—LOAN.—The Town Council has applied for sanction to a loan of £1,550 for a rotary-convertor, switchgear, &c., for the Grosvenor Road sub-station.

WIRING OF SMALL HOUSES.—The electrical engineer is to submit proposals for the installation of electricity in small houses under an assisted wiring scheme.

SHOWROOMS, &C.—A public exhibition of electrical appliances is to be held in September, and it is proposed to open a permanent showroom for the undertaking.

York.—NEW BOILER PLANT.—The City Council has received sanction to the installation of two new boilers in place of certain existing boilers at Foss Islands generating station.

Tramway and Railway Notes.

Bradford.—Tramway Accounts.—A loss of about £10,000 on the year's working of the city tramway is attributed to the general strike. The loss on the tramway during the year has been largely compensated for by increased receipts on the railless-car services and the department's motor-'buses. The revised fares, outlined in our issue of March 25th, came into operation on April 4th.

Continental.—Poland.—Construction work on the first long-distance tramway, between Warsaw and Zyrardow, a distance of 30 miles, which was entrusted to the Power and Traction Finance Co., of London, has been completed. Services will begin when the rolling stock arrives from Great Britain.—*Reuter* (Warsaw).

Belgium.—The Compagnie Générale des Tramways d'Anvers has recently replaced the old rotary convertors at its transformer stations at Merxem and Hoboken by mercury rectifiers. A new transformer station is to be constructed in Antwerp.

Croydon.—Route Abandoned.—The Addiscombe route of the Corporation tramway was closed down on March 31st, and a motor-omnibus service introduced by the London General Omnibus Co. The company has agreed to employ a large number of the men affected by the change, and work is to be found for the remainder.

Dearne Valley.—Fares.—The Dearne Valley Light Railway Committee met recently to receive the report of a deputation which had interviewed Sir Henry Maybury, Director-General of the Roads Department, Ministry of Transport, on the question of protective fares for the Light Railway, over the route from Thurnscoe to Barnsley. According to the *Electric Railway and Tramway Journal*, this matter had been previously discussed with the Minister, but some doubt still remained whether the arrangement applied to the whole route or only that part of it in the areas of the four Councils who form the Light Railway authority. The Committee contended that the protective fares applied to the whole route, and emphasised this in its representations to the Minister. The Minister's ruling on the point is not yet known. It is understood that he is arranging a meeting with the other interested party, the Barnsley Traction Co.

Glasgow.—Tramway Improvements.—A scheme for the reorganisation and reconstruction of the rolling stock of the Corporation tramways has been approved by the Tramways Committee. It is proposed that tenders be invited for 50 new double-deck cars, and for the reconditioning of 150 of the present cars, the work to be carried out at the Department's workshops at Coplawhill. The estimated cost is £345,000. The proposals have been submitted to the Corporation for approval.

Heywood and Middleton.—Light Railways.—The Minister of Transport has recently made the Heywood and Middleton Light Railways Order, 1927, authorising the construction of light railways in the boroughs of Heywood and Middleton.

London.—"Tube" Telephones.—According to *The Times*, further safety devices are being installed on the Underground Railways in the form of telephonic means of communication between driver and guard, and experiments are now being made to ascertain whether the arrangement could be effectively employed to allow of the use of instruments in the carriages, so that announcements as to routes, non-stopping, &c., might be made by the guards to passengers throughout the train. The policy of the company is to reduce to a minimum all automatic or routine manual work, as such work is monotonous and often wasteful. The aim must be to supply the most efficient and fully-developed instrument to be handled by a limited but skilled staff. The change of system will occupy at least two or three years to carry out.

Tramway Station.—The Metropolitan Electric Tramways Co., Ltd., is to construct a tramway station in the forecourt of the Golder's Green Tube station on property belonging to the railway company, and a connection from the existing tramway in Regent's Park Road to connect up with the station at a cost of £1,870.

Tramway Reconstruction.—The Highways Committee of the L.C.C. has recommended the doubling of the tramway track in Old Street and Kingsland Road, at an estimated cost of £12,000.

Perth.—Proposed Abolition of Tramcars.—A Special Committee of the Town Council recently considered a report submitted by Mr. Pilcher recommending the substitution of motor-omnibuses for the present tramway system, and it was decided to meet Mr. Pilcher to discuss his report.

West Hartlepool.—Railless Cars.—Mr. J. H. Parker, Corporation electrical engineer and transport manager, in the course of a recent address to local Rotarians, stated that the town had the largest fleet of pneumatic-tired railless cars of any transport authority in the country. Tramcars had their merits as large-capacity moving platforms in densely-populated areas, but were doomed for passenger traffic outside those conditions. In answer to the criticisms as to the cost of the new service, he stated that the total cost of the new vehicles, the overhead equipment, taking up the tramway track, and the restoration of the roadway, would amount to less than half what it would have cost to relay the tramway track.

The new railless-car service between West Hartlepool and Seaton Carew was formally inaugurated on March 28th. With the conversion of this route, the Corporation's transport service has been completely changed over to railless cars.

Telegraph and Telephone Notes.

Aircraft Navigation.—New Wireless Station.—Among the developments now in hand for the reorganisation of the London air port at Croydon is the provision of a new wireless station, which is to be erected for the Air Ministry by Marconi's Wireless Telegraph Co., Ltd., to replace the one that has done duty there for the last seven years. The new station will consist of a group of four 3-kW transmitters operated in conjunction with a direction-finding receiver. The transmitters will be capable of telephony and continuous-wave and interrupted continuous-wave telegraphy transmission, the wave range being from 800 to 2,000 metres; independent drive circuits will be incorporated to maintain constancy of frequency and wave-length, and energy is to be supplied by a common motor-alternator group, the power from which may be switched on to any of the transmitters. The new direction-finding receiver has been specially designed to have selective characteristics and incorporates filtering and amplifying devices; it is arranged so that, if required, two or more circuits can be operated on different wave-lengths for the reception of telephony and telegraphy on the same aerials. In order to keep the neighbourhood of the aerodrome as free as possible from obstruction, the wireless masts and transmitters will be erected two or three miles from the air port and operated by the "remote-control" system.

"Beam" Radio-Telegraphy.—Australian Service Opened.—Amalgamated Wireless (Australasia), Ltd., announces that the radio-telegraph "beam" service between Australia and England will be opened to-day, April 8th. Messages will be accepted throughout Australia to all parts of Great Britain, Ireland, and the Continent of Europe, and messages from Great Britain, Ireland, and the Continent of Europe will be received for delivery to any address in Australia. Although cable rates between England and Australia have been reduced twice during the past twelve months, the rates of the "beam" wireless service will be lower than the existing cable rates and one-third less than the cable rates existing on January 1st, 1927. A second "beam" station is now being completed for the Amalgamated Wireless Company to give a direct service to and from Montreal. Over this route messages to and from all parts of Canada and the United States and South America will be sent and received, and it will also be available if required as an additional channel of communication with London.

Ecuador.—Telephone Reconstruction.—The Allmaenna Telefonaktiebolaget L. M. Ericsson has received an order from the Government of Ecuador for the complete reconstruction of the telephone system in Quito, the capital. The new system will be equipped to serve 2,000 subscribers to begin with.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—"Absent Subscribers'" Service.—What is known as the "absent subscribers' telephone service" was initiated, as an experiment, on April 1st by the Post Office. The City exchange was selected for testing the service, under which a subscriber, before going out and leaving his telephone unattended, may inform the exchange how long he will be out and where he may be found, for the benefit of persons ringing him. The fee is: For any period of interception not exceeding four hours, sixpence; exceeding four hours, one shilling. For every call intercepted a charge of a penny will be made. The minimum period for interception is half-an-hour, and the operator continues to intercept calls until the subscriber returns and notifies the switchboard.

Transatlantic Telephony.—London-Mexico Service.—The long-distance telephone line between Mexico City and San Luis Potosi, covering half the distance between the capital and the American border, is now open, and it is expected that the remaining half will be completed in September. By an agreement between the Telephone and Telegraph Companies of Mexico and America, the privileges of the transatlantic service to England will then be extended to Mexico.

Radio Notes.

France.—SCHOOL AERIALS.—On the ground that aerials might during a sudden storm fall to the ground and injure passers-by, the directors of Paris public schools have been requested to take down the aerials erected over their buildings, says the *Daily Mail*. The Paris municipal authorities justify their decision by arguing that the wireless sets installed in buildings used as public schools are not used by the directors for the purpose of teaching their pupils, but solely for their own personal amusement.

Japan.—NEW STATIONS.—A considerable extension of Japanese broadcasting is indicated by an order which has been placed with Marconi's Wireless Telegraph Co., Ltd., by the Japanese Broadcasting Association for three broadcasting transmitters. They are to be designed to deliver 10 kilowatts of aerial energy, and it is understood that one is to be located in the Japanese capital (Tokio), and another in Osaka, the largest city in Japan; the situation of the third station has not yet been indicated. Tokio will be the twelfth capital city of the world in which a Marconi broadcasting station has been installed.

It is reported that an order has also been placed with Standard Telephones and Cables, Limited, for the complete equipment of three broadcasting stations, their associated studios and the necessary machinery, for the Japanese Broadcasting Association. The stations will have three times the power of 2LO, which is of 3-kW capacity.

Licences.—SUBSTANTIAL INCREASE.—On the last day of February, 1927, the number of receiving licences issued by the Post Office had reached 2,234,988, an increase of 329,000 in a year; the total is exclusive of the 4,403 licences which have been granted free of charge to blind persons.

Loud-Speakers.—SHEFFIELD BY-LAW.—The Watch Committee of the Sheffield City Council has recommended the making of a by-law to control the use of wireless loud-speakers which cause a nuisance by their "noise." A fine not exceeding £5 is the proposed penalty.

New High-Power Station.—PLANT INSTALLED.—Complete new transmitting apparatus has been instaled at the Daventry broadcasting station; it will have a power of 20 kW and operate on a wave-length between 300 and 400 metres. It will be the first true source of alternative programmes in this country, which, however, are not likely to become available until the autumn, for the test period will be a lengthy one. When the Postmaster-General formally sanctions the establishment of the first h.p. regional station, the new plant will be removed from Daventry to the location chosen for that purpose.

South Africa.—NEW COMPANY.—As has already been briefly stated, an agreement has been signed between the Minister of Posts and Telegraphs and Mr. I. W. Schlesinger, of the African Theatres, Ltd., and African Films, Ltd., for the grant of the licence of the J B station to the African Broadcasting Co., which was formed by, and its capital underwritten by, Messrs. I. W. Schlesinger & Co., and listeners will be given preference in the allotment of shares. The Government has two directors and the Transvaal Radio League one. The company will control broadcasting in the Transvaal and Orange Free State. If the licences at Cape Town and Durban are at any time surrendered voluntarily they will be transferred upon application to the A. B. Co. Meanwhile the relaying of A. B. Co.'s programmes will be prohibited unless duly authorised. Within nine months the existing station will be transferred to Bloemfontein, and a licence will then be granted for transmission in the Free State, says *World Radio*, and a more powerful station will be erected in Johannesburg. The Transvaal and Orange Free State licences are to be granted for five years with the option of renewal for another five, the Government retaining the right to take the licence during the latter period. Out of the first profits shareholders will first receive a non-cumulative dividend of not more than 10 per cent. per annum; thereafter further profits will be distributed equally between shareholders and the Government, the latter using its share to reduce fees. To check piracy, the Minister has promised to ask Parliament to pass an Act compelling traders to examine their clients' licences before the latter can purchase wireless sets or parts.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—May 10th. Postmaster-General's Department. Telephone relays. (B.X. 3333.)*
May 17th. Resistances and reactances. (B.X. 3307.)*
May 23rd. State Electricity Commission. Switchgear and accessories. (B.X. 3285.)*
May 9th. 6,600-V transformers and spares. (B.X. 3331.)*
July 5th. One 15,000-kW steam turbo-generator and accessories. (B.X. 3369.)*
SYDNEY. — May 9th. Electricity Department. Station auxiliary switchgear. (B.X. 3338.)*
April 26th. A.c. electricity meters. (B.X. 3407.)*

Barnes.—Electricity Department. 1,200 yd. l.p. armoured multiple cable. (April 1st.)

Barking.—May 9th. County of London Electric Supply Co., Ltd. Cables and accessories for the Barking power station. (April 1st.)

Belgium.—BRUSSELS.—May 13th. Municipal Council. Two 6,000-kW steam turbo-generator sets and one 1,500-kW set, for the municipal power station. Particulars (Cahier des Charges), for 125 francs, from Hotel de Ville, Brussels.

Bolsover.—April 19th. Urban District Council. Cables, boxes, pillars, &c. (April 1st.)

Bristol.—April 11th. Electricity Department. 39 miles (approx.) 3-core, paper-insulated cable. (March 18th.)

Clayton.—April 18th. Urban District Council. E.h.p. feeder cables, l.p. distributing mains, fuse pillars and transformer kiosk. (April 1st.)

Colombia. — BOGOTA.—April 30th. Ministry of Public Works. Two electric lifts. (A.X. 4433.)*

Edinburgh.—April 9th. Education Authority. Electric installation at St. Anthony's R.C. School, Leith. Schedules from office of the Authority.
April 18th. Electricity Supply Department. De-aerating plant and boiler feed pumps. (March 25th.)

Glasgow.—April 23rd. Parish Council and District Board of Control. Stores, including electrical fittings and lamps, for six months. Forms, &c., from Mr. A. Reynard, inspector and clerk, 266, George Street, Glasgow.

Ilford.—April 26th. Electricity Department. One 1,500-kW motor-convertor or rotary-convertor and transformer, 6,600-V switchgear cubicles and alterations to existing switchgear. (See this issue.)

India.—India Store Department. April 26th. 66-kVA motor-driven alternator sets, transformers, switchgear, &c. (April 1st.)
Telephone cable. (See this issue.)

London.—HOLBORN.—April 13th. Board of Guardians. Electric lighting installation at the London Road, Mitcham, schools. (March 18th.)
LONDON COUNTY COUNCIL. April 12th. Wiring and fittings for electric lighting for Everington Street School, Fulham (approx. 196 points). (April 1st.)
April 22nd. Electrical installation at the Stonhouse Street elementary school, Clapham (approx. 167 points). (See this issue.)
April 26th. Wiring and fitting for electric lighting in two blocks of tenements at the Ring Cross housing estate, Islington (approx. 274 wiring points).
G.W.R. April 21st. Stores, including electrical wires and cables and telegraph ironwork. (April 1st.)

New Zealand.—WELLINGTON.—May 31st. Public Works Department. 50-kVA transformers for the Waikaremoana electric power scheme. (B.X. 3294.)* 50-kVA transformer for Arapuni scheme. (B.X. 3293.)*
June 21st. Sub-station switchgear and metering equipment for Arapuni. (B.X. 3398.)*
June 7th. Railway sub-station equipment, Lake Coleridge electric power scheme. (B.X. 3295.)*
May 4th. General Post Office, Stores Division. Sub-station protectors. (B.X. 3286.)*

June 13th. New Zealand Railways. Machine tools, workshop equipment and overhead electric travelling cranes. (A.X. 4344.)*

June 6th. Six electric locomotives. (A.X. 4355.)* Overhead equipment for the Christchurch-Lyttelton electrification scheme. (B.X. 3301.)*

Invercargill.—May 31st. Southland Electric Power Board. Transformers. (B.X. 3379.)*

June 15th. 66,000-V, oil circuit-breakers. (B.X. 3378.)*

Plymouth.—April 25th. Electricity Department. Electricity meters, cables, and transformers. (April 1st.)

South Africa. — Johannesburg. — May 7th. Municipal Council. Electric street lamp fittings and globes. (B.X. 3395.)* Cables. (B.X. 3406.)*

Cape Town.—June 1st. The University. Electric cooking utensils for the new residences at Groote Schuur. (B.X. 3393.)*

Southend-on-Sea.—April 9th. Light Railways and Electricity Department. Remote-controlled rotary convertors. (March 11th.)

April 19th. 4,000 joint boxes. (March 25th.) 1,400 current limiters. (April 1st.)

Spain.—Madrid.—Ministerio de Fomento. Six electric cranes for the port of Alicante.—*Reuter's Trade Service* (Madrid).

Stafford.—April 30th. Staffordshire Education Committee. Electric wiring and fittings for the new infants' department of the Slater Street Council school and in the additional class rooms, laboratory, &c., in the Salisbury Street central school. (See this issue.)

Uruguay.—Montevideo.—June 15th. State Electricity Supply Works. 15 transformer sub-station equipments (6,600/220 V, 50 cycles). (B.X. 3371.)*

Wrexham.—April 19th. Electricity Department. One 250-kW rotary-convertor equipment and d.c. switchgear. (April 1st.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Melbourne.—Commonwealth P.M.G.'s Department. Accepted :—

Underground and aerial cable.—(£123,303), British Insulated Cables, Ltd.; (£59,832), Connollys (Blackley), Ltd.

Insulated wire (£1,723).—W. T. Henley's Telegraph Works Co., Ltd.

—*Tenders.*

Birkenhead.—Elecricity Committee. Recommended:—

11,000-V overhead and underground transmission lines (£26,308), l.p. distributing mains for Heswall and Gayton (£15,288).—W. T. Henley's Telegraph Works Co., Ltd.

Brighton.—Tramways Committee. Accepted:—

Brake blocks (£144).—Dover Engineering Works, Ltd.
Trolley wire (£84).—Elliotts Metal Co., Ltd.
Steel tires (£222 15s.)—A. Brown & Co.
Tungsten filament lamps (£100).—Kye, Ltd.

Dundee.—The Electricity Committee has decided to accept tenders for cables from three foreign firms in preference to British offers. The foreign quotations (Dutch, Danish, and German) were £648 lower than the British offers.

Eastbourne.—Electricity Committee. Accepted:—

Cable, transformers and switchgear in connection with the ring main (£10,192).—Standard Telephones and Cables, Ltd.

Glasgow.—Tramway Committee. Recommended:—

Welding of rail joints.—Thermit, Ltd.
Special track work.—Hadfields, Ltd.

Corporation. Recommended :—

Additional electrical work at Kelvin Hall (£119).—Edmiston, Brown & Co.

Hull.—Telephones Committee. Recommended:—

3 tons bronze wire (£276).—F. Smith & Co.

Japan.—

Complete radio equipments for three 10-kW broadcasting stations for the Japanese Broadcasting Association.—Standard Telephones & Cables, Ltd.

London.—London County Council Education Committee. —Wiring and fittings for electric lighting, power telephones, electric clocks and bells at Trade School for Girls, Barrett Street, Marylebone :—

E. Wender	£947
Alpha Manufacturing and Electrical Co., Ltd. (accepted)	995
Anderson, Angell & Co.	1,062
J. F. Prendergast	1,095
L. G. Tate & Co., Ltd.	1,098
Alex. Hawkins & Sons	1,157
Richard Hunt & Co., Ltd.	1,167
J. Briggs & Co.	1,241
Pinching & Walton	1,365

Post Office.

Telephone switchboard lamps.—Edison Swan Electric Co.,

London, Midland & Scottish Railway Co.

Part contract for the supply of electric lamps.—British Thomson-Houston Co., Ltd.; Metro-Vick Supplies, Ltd.

London & North-Eastern Railway Co.

Electric lamps.—Edison Swan Electric Co., Ltd.

Southwark.—Electricity Committee. Accepted :—

Battery plates (£189).—Alton Battery Co.

Plymouth.—Tramways Committee. Accepted:—

25 tramway standards (£240).—Equipment & Engineering Co., Ltd.

Reigate.—Rural Council. Accepted:—

Wiring and fitting houses at Chipstead for electric light at £4 16s. and £5 12s. each.—County of London Electric Supply Co., Ltd.

Salford.—Baths Committee. Accepted:—

Electric lighting installation at the Hodge Lane baths and washhouse (£268).—R. H. Clampett & Co.

Electricity Committee. Accepted :—

Extras on the contract price on account of delay and additional testing expenses in connection with the supply of turbo-alternators at the Agecroft power station (£3,950). — Metropolitan-Vickers Electrical Co., Ltd.

Dismantling and supplying new pressure part for No. 19 boiler economiser (£1,100 approx.).—Babcock and Wilcox, Ltd.

Tramways Committee. Accepted :—

25 fully-enclosed top covers for tramcars (£15,300).—Massey Bros.

Sheffield.—Electricity Supply Committee. Accepted:—

12,000-V switchgear for Blackburn Meadows generating station.—A. Reyrolle & Co., Ltd.

South Africa.—*The South African Engineer* states that the Electricity Committee of the Durban Town Council is of opinion that a preference of not more than 10 per cent. should be given to goods of British manufacture over those of foreign origin, and has accordingly recommended the acceptance of auto-transformers from Holland, where the saving was 14 per cent., and lamps from Austria, where the saving varied from 14 per cent. to 19 per cent., but in the case of cables for interconnection between Alice Street and Congella power stations, it preferred the lowest British offer, the gross difference in price, compared with cable from Holland, being 9.8 per cent., which would have been appreciably reduced by the consulting engineers' charges for inspection and testing.

Forthcoming Events.

Physical Society.—Friday, April 8th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Junior Institution of Engineers.—Friday, April 8th. 39, Victoria Street, S.W. 7.30 p.m. "Electrical Osmosis." Mr. E. Ambrose.

Women's Engineering Society.—Friday, April 8th. 26, George Street, W. 6.30 p.m. "A Business Woman's Trip to America." Miss E. M. Kennedy.

Royal Institution.—Friday, April 8th. 9 p.m. "Early Days in Radio-Activity." Sir Ernest Rutherford, F.R.S. Saturday, April 9th. 3 p.m. "The Alpha Rays and Atomic Structure." Sir Ernest Rutherford, F.R.S.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, April 9th. School of Mines, Treforest. 6 p.m. "Aerial Wire Ropeways." Mr. J. W. White.

(London Branch).—Tuesday, April 12th. Junior Institution of Engineers. 6.30 p.m. "Mixed Pressure Turbines for Colliery Use." Mr. C. H. Naylor.

Chief Technical Assistants' Association.—Saturday, April 9th. Holborn Restaurant. 7.45 p.m. Annual dinner.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, April 11th. London. 7 p.m. "Maintenance of Small Electric Power Plant." Mr. T. Hodge.

(**North-Eastern Centre**). — Monday, April 11th. Literary and Philosophical Society, Newcastle-on-Tyne. 7 p.m. "The Applications of Electricity to Agriculture." Dr. A. Ekström.

(**Scottish Centre**).—Tuesday, April 12th. Royal Technical College, Glasgow. 7.30 p.m. "The Applications of Machinery at the Coal Face." Mr. S. Mavor.

(**Western Centre**).—Monday, April 11th. South Wales Institute of Engineers, Cardiff. 7 p.m. "The Design of City Distribution Systems." Messrs. J. R. Beard and T. G. N. Haldane.

(**South Midland Centre**).—Wednesday, April 13th. University, Birmingham. 7 p.m. "The Applications of Electricity in Warships." Mr. W. McClelland.

Edinburgh Electrical Society.—Thursday, April 14th. 117, George Street. 8 p.m. Business meeting.

Electrical Power Engineers' Association (Manchester Section).—Thursday, April 14th. Geographical Hall, Manchester. 7.30 p.m. "Rotary Convertors." Mr. E. P. Hill.

(**Glasgow Section**).—Friday, April 15th. Reid's Restaurant, Glasgow. 7.30 p.m. "Modern X-Ray Plant and Practice." Mr. W. S. Weir.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

A hand lamp with magnet in base so that the lamp will attach itself to ironwork. Must operate on usual supply voltages.

An electrical band saw brazing machine.

Notes.

Summer Time.

Readers are reminded that "summer time" comes into operation this week-end. All timepieces should accordingly be advanced one hour during the night of Saturday-Sunday, April 9th-10th.

The British Science Guild.

The British Science Guild dinner will be held at the Criterion Restaurant, London, on Thursday, May 13th, when the Rt. Hon. Lord Askwith, K.C.B., K.C., will preside. Amongst the speakers and other guests will be Sir Alfred Mond, Bart., P.C., M.P., Sir Herbert Samuel, P.C., G.B.E., General Sir George Milne, G.B.E., G.C.M.G., K.C.B., D.S.O., and Sir William Pope, K.B.E., F.R.S. Particulars may be obtained from the Secretary, 6, John Street, Adelphi, W.C.2.

Electricity in Mines.

The 1926 edition of the annual volume of "Regulations and Orders under the Coal Mines Act, 1911," has now been published (H.M. Stationery Office, price 1s. net, by post, 1s. 3½d.). In this edition, which contains the Statutory Rules and Orders relating to mines in force on January 31st, 1927, the amending orders have been consolidated with the relative principal orders, and a general subject index has been added.

Public Lighting Conference.

The annual conference of the Institution of Public Lighting Engineers is to be held this year at Brighton on September 12th to 15th. Among the important papers which will be read are one on the "Public Lighting Scheme of the Borough of Brighton," by Mr. John Christie, M.I.E.E., engineer and manager, Brighton electricity undertaking; and a joint paper, "Descriptive of the British Engineering Standards Association's Standard Specification for Street Lighting," by Capt. L. B. W. Jolley, M.A., M.I.E.E., research engineer, General Electric Co., Ltd., and Mr. Robert Watson, engineer and manager, Doncaster gas undertaking. The proceedings will also include the address of the incoming president, Mr. A. C. Cramb, M.I.E.E., engineer and manager, Croydon Electricity Department. During the conference there will be an exhibition of some of the most modern street-lighting appliances.

Electrical Precipitation of Gold.

An electrical device for reclaiming the particles of gold which formerly escaped up the flue of the smelting furnaces has just been installed in the Government Assay Office at New York. In tests, as much as 600 oz. of gold has been reclaimed from 5,000 lb. of dust extracted from the fumes. Electrical action drives the dust particles from the heavy gases; the dust is collected, and the gold recovered by smelting again. Silver and platinum atoms are also arrested by the device.—*Reuter's Trade Service* (New York).

The Engineers' Club (London).

During this month eleven meetings of societies are being held at the Engineers' Club, of which three are electrical.

Appointments Vacant.

Showroom manager for the Westminster Electric Supply Corporation, Ltd. Meter assistant for the Fulham Borough Council, Electricity Department. (See our advertisement pages to-day.)

Service Notes.

From 15 to 20 vacancies for permanent commissions in the Stores Branch of the Royal Air Force will be offered for competition among young men between 23 and 25 years of age who have not less than five years' business experience in a firm of standing. Accepted candidates will be gazetted to commissions as pilot officers on probation, and will be eligible for promotion to the rank of flying officer. Particulars can be obtained from the Secretary, Air Ministry, London, W.C.2.

Electrical Association for Women.

On March 30th, a party of members of the above Association visited the Poplar power station and were shown the new pulverised-fuel plant. During tea at the staff canteen Mr. J. H. Bowden, borough electrical engineer, and Councillor Keys, chairman of the Electricity Committee, outlined the work which is being carried out by the electricity undertaking.

Conference on Extra-High-Pressure Systems.

As announced in our issue of January 7th, the Fourth International High Pressure Transmission Conference is to be held in Paris from June 23rd to July 2nd next. The work of the Conference will be divided into three main divisions, to each of which a couple of days will be allotted, *viz.*, The Production of Power; The Construction of Transmission Lines; and The Operation of Transmission Systems. Two days will also be devoted to excursions and visits to electrical installations in the Paris district.

The Institution of Engineers-in-Charge.

ANNUAL DINNER.—On Saturday last the annual dinner of this Institution was held at the Holborn Restaurant, London. The president, Mr. L. St. L. Pendred, M.I.Mech.E., was in the chair, and amongst the many guests were Mr. W. H. Patchell and Mr. T. Cooper, past-presidents, Eng. Vice-Admiral Sir R. B. Dixon, Sir Henry Fowler (Pres. I.Mech.E.), Eng.-Capt. W. Onyon (Pres. I. Marine Engineers), Dr. W. H. Eccles (Pres. I.E.E.), Sir Philip Dawson, Sir W. J. Berry, Mr. J. L. Musgrave (Pres. I.H. & V.E.), Mr. D. A. Bremner, and Mr. R. H. Hutchinson (Pres. I. Prod. Engineers).

After the loyal toasts, Sir Philip Dawson proposed "The Institution," commenting on the opportunities it afforded the members to interchange information and thus increase the efficiency of their installations, to visit works, and to engage in social intercourse. He urged them to promote that goodwill and co-operation between employers and employed which was indispensable to industrial success, and prophesied that the closing of small generating stations by the Central Electricity Board would not result in loss of employment to their staffs. The president responded, expressing admiration at the efficiency with which the work of the Institution was carried on, and commending the ability and enthusiasm of Messrs. G. A. Hughes and J. E. Watkins, and Capt. A. E. Penn, the hon. secretary. The meetings, he said, were thoroughly practical; the members spoke of what they really knew.

Mr. H. King, vice-chairman, proposed "Our Guests and Friends," expressing gratitude for the support of the leaders of the great Institutions; Sir Henry Fowler, responding, emphasised the importance of the men who used the machines, and Dr. W. R. Ormandy, also responding, referred to the value of meeting men who controlled men. Mr. W. Edwards, chairman, proposed the health of "Our President," quoting a horoscope cast by Capt. Penn; Mr. Pendred, in response, said he was impressed with the active social side of the Institution, and urged that it was essential for all classes to "get together." All the great engineering inventions were British, and if they held together and used all their resources they would come out on top, in spite of the burden of taxation that weighed upon industry.

Mr. W. H. Patchell proposed the health of the hon. secretary, paying a tribute to his industry and efficiency; and Capt. Penn briefly acknowledged the compliment. A programme of music, interspersed with the speeches, contributed to the success of an enjoyable evening.

Gear-Tooth Grinding.

We have received a copy of a pamphlet, "Notes on straight spur gears with special reference to gear-tooth grinding," by A. H. Orcutt. The author advocates the gear-grinding machine as the only solution to the difficulty of keeping the tooth design within the necessary limits of accuracy. With heavily loaded gearing running at high speeds it is necessary for the error of each tooth to be under .0003 in. Advantage can also be gained by using ground gears for light loads and slow speeds. The truing device on the "Orcutt" machine is briefly described, and the process of setting up and inspection by the Gear Grinding Co., Ltd., is given.

Institution Notes.

Institution of Electrical Engineers.

Summer Meeting.—The summer meeting is to be held this year from June 14th to 17th, at the North-Eastern Centre, Newcastle-upon-Tyne. Visitors will assemble at the Central Station Hotel on the Monday evening to meet the Committees of the Centre (Mr. J. Rosen, chairman) and of the Tees-side Sub-Centre.

On the Tuesday morning and afternoon visits will be paid to the Heaton works of C. A. Parsons & Co., Ltd., and the Hebburn works of A. Reyrolle & Co., Ltd., and there will be a civic reception in the evening at Newcastle.

On the Wednesday morning the North Tees power station of the Newcastle-upon-Tyne Electric Supply Co., Ltd., will be inspected, whilst in the afternoon the main party will proceed on an excursion to Durham, and a subsidiary party (limited to 100) will visit the Blackhall pit of Horden Collieries, Ltd. The evening will be free for members to do as they choose.

On the Thursday there will be alternative visits to the Elswick works of W. G. Armstrong, Whitworth & Co., Ltd., or to the Ford Potteries of C. T. Maling & Co., Ltd. (party limited to 60). During the afternoon alternative visits will be paid to the Wallsend shipyard of Swan, Hunter & Wigham, Richardson, Ltd. (party of 150), the Ford Potteries (party of 60), or the new library at Armstrong College, Newcastle, the Council of which will hold a reception and dance in the evening.

On the Friday morning the new steel works and rolling mills of the Consett Iron Co., Ltd., will be inspected; ladies are advised to avail themselves of the alternative excursion to Hexham and the Abbey. In the afternoon both parties will visit the Roman wall and camp at Borcovicus, returning to Newcastle, where an evening reception and dance will terminate the proceedings.

Mersey and North Wales (Liverpool) Centre.—The annual meeting of the Centre will be held at Liverpool on April 25th. The Committee has nominated the following officers for the 1927-28 session:—*Chairman*—Prof. F. J. Teago, D.Sc.; *vice-chairmen*—Mr. S. E. Britton and Prof. E. W. Marchant, D.Sc.; *ordinary members of committee* (four vacancies)—Mr. G. D. Coe, Mr. H. C. Hazel, Mr. W. M. Horsfall, Mr. E. V. L. Mathias, and Mr. J. L. F. Vogel; *hon. secretary and treasurer*—Mr. Oscar C. Waygood.

Western Centre Summer Meeting.—The week-end summer meeting of the Centre this year is to take the form of a visit to Plymouth, where the chairman, Mr. W. G. Heath, resides, from Friday, May 20th, to Monday, May 23rd. It is proposed to make the journey by charabanc, starting from Weston-super-Mare if the steamers are running, or from Bristol; ladies are specially invited.

The Faraday Society.

Change of Address.—It is announced that the Society has changed its address to 13, South Square, Gray's Inn, London, W.C.1; its telephone number is Chancery 7230.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The appointment of Mr. Archibald Page, M.I.E.E., to be chief engineer and manager to the Central Electricity Board, which was briefly mentioned in our last issue, marks an important step towards the organisation of the staff of that body. Mr. Page, whose portrait is here reproduced, is a native of Alloa, N.B., and was educated at Dollar Academy; he received his technical training at the Heriot-Watt College, Edinburgh, and the Royal Technical College, Glasgow. After practical service at the Broad Street Engine Works, Alloa, and Messrs. Mavor & Coulson's, at Glasgow, he joined the staff of the Glasgow Corporation Electricity Department in 1899, and quickly rose to the position of chief assistant engineer under Mr. W. W. Lackie, and deputy chief engineer, positions which he occupied from 1905 to 1917. He then became assistant general manager to the Clyde Valley Electrical Power Co., and two years later general manager. In 1920 he was appointed one of the first Electricity Commissioners. At the end of June, 1925, Mr. Page returned to active participation in the electricity supply industry, becoming a director and general manager of the County of London Electric Supply Co.

His new post is perhaps the most important, and certainly the most onerous, that is open to the ambition of electrical engineers in this country. As engineer to the Board, Mr. Page will be charged with the duty of carrying out the schemes of interconnection and transmission on a colossal scale which are being prepared by the Electricity Commission for submission to the Central Electricity Board; as manager he will conduct an enormous commercial enterprise—the purchase and resale of more than half the total output of the statutory undertakings of the country. But as nothing has been done yet, and it will take time to build up the huge machine and get it into motion, his work for the present will be mainly constructive, laying the foundations well and truly for the structure that will be erected during the next ten or twenty years—the most important commercial undertaking in the Empire. He will take up his new duties on May 1st.

Mr. Page, who has been a vice-chairman of the Scottish Centre, is a vice-president of the Institution of Electrical

Lafayette [*Glasgow*

Mr. Archibald Page,
Chief Engineer and Manager to the Central Electricity Board.

Engineers; he is held in the highest esteem by his electrical *confrères*, on account of his professional ability as well as his personal qualities, and his appointment will restore the confidence of many whose anticipations of the working of the Act were far from optimistic.

Mr. A. S. Blackman, general manager and engineer of the Sunderland Corporation Electricity Department, has returned from the three months' leave of absence which the Corporation granted him upon his completion of 20 years' service.

Mr. George Offor had many callers and a host of congratulatory letters and telegrams from his friends on March 30th, when he attained his hundredth birthday. The King and Queen sent a telegram wishing him peace and happiness for the remainder of his days, and among the day's callers at Peak Hill Villa, Sydenham, were Sir Philip Dawson, member for the Division, and Lady Dawson, and a delegation from the British Electrical Federation, Kingsway. A brief thanksgiving service, conducted by local ministers, was held at the house, which was decorated with many floral gifts.

At Colne, on March 31st, Mr. Edgar Duckworth, of the London and Provincial Radio Co., was married to Miss Emily Stansfield, of Foulridge.

Accrington Council is recommended to confirm an increase in the salary of Mr. A. W. Clegg, the electrical engineer, from £866 to £913, with a further addition of £50, with bonus at the full rate then prevailing, from April 1st, 1928.

Mr. John Macleod, secretary of the Oriental and China and Japan Telephone Companies, retired on the 31st ult., after 45 years' service.

About 100 members of Blackpool Athenæum Club assembled on March 31st, when a dinner and dance were held in honour of the chairman, Mr. Charles Furness, borough electrical engineer.

The salary of the Perth Corporation electrical engineer has been increased by £25.

The *Financial News* reported last week that Lord Ampthill and Major O. Sumner, O.B.E., accompanied by their principal contracting and electrical experts, had left Southampton by the R.M.S.P. *Andes* in connection with important public works developments in the Argentine Republic.

The *Daily Telegraph* states that Sir James Parr, the High Commissioner for New Zealand, has been nominated by the New Zealand Government as its representative on the reconstituted Pacific Cable Board.

Mr. Robert Allan, of Messrs. Allan & Mayes, electrical engineers, Falkirk, was presented with a clock by staff and friends on the occasion of his marriage.

As we briefly reported last week, Mr. S. J. Watson, borough electrical engineer of Salford, has been appointed chief engineer to the London and Home Counties Joint Electricity Authority. Mr. Watson went to Salford over four years ago, relinquishing a similar post at Bury, which he had held since 1896. Prior to that he was station superintendent to the National Electric Supply Co., Preston. In 1917-18 he was president of the Incorporated Municipal Electrical Association, and he has been chairman of the Manchester local section of the Institution of Electrical Engineers.

Mr. S. J. Watson, M.Inst.C.E., M.I.E.E.,
Chief Engineer to the London Joint Electricity Authority.

Mr. Watson's resignation came before the Salford Electricity Committee on March 30th. In accepting it the Committee expressed its regret at losing Mr. Watson, and placed on record its high appreciation of his services and abilities. Congratulations on his new appointment were also extended to him. The Committee decided to invite applications for the position of city electrical engineer at a salary of £1,500 inclusive, rising by annual increments of £100 to £2,000.

Obituary.—Mr. W. R. Mickelwright.—The death of Mr. W. R. Mickelwright, to which we briefly referred last week, occurred on March 23rd. He was managing director of Mickelwrights, Ltd., electrical engineers, of Alperton, Wembley. He received his early training at Finsbury Technical College, leaving there to take up a post with the Central London Railway. He founded the firm of Mickelwrights, Ltd., in 1912, and served during the war in the Royal Naval Air Service. He had a large circle of business friends, and the Wembley Radio Society had in him a popular secretary.

Eng.-Com. W. Dobson.—We regret to record the death, which occurred on March 29th, at Wembley, after a few hours' illness, of Engr.-Commander William Dobson, R.N.R., M.I.E.E., superintendent electrical engineer at Stonebridge Park power station of the L.M.S. Railway. After serving an apprenticeship with Vickers-Maxim's at Barrow-in-Furness from 1889-1892, he became engineer-in-charge of various liners of the P. & O. S.N. Co., and was granted a commission in the Royal Naval Reserve in 1896. From 1898-1904 he was assistant engineer in the Whitehall Court, Rathbone Place and Amberly Road stations of the Metropolitan Electric Supply Co., Ltd. In 1904-1905 he was operation and guarantee engineer for the Neasden power house contract (Metropolitan Railway) on behalf of the British Westinghouse Co. Then followed seven years (1905-1912) as assistant electrical engineer with the Metropolitan Railway in charge of the electrical operation of the power house and sub-stations, also the train equipments; and, finally, service from 1912 to 1927 as superintendent electrical engineer at Stonebridge Park power station, as stated above. He was 58 years of age.

Mr. G. A. Schanschieff.—We regret to record the death, at the early age of 49 years, of Mr. George A. Schanschieff, for 25 years managing director of the Premier Accumulator Co., Ltd., of Northampton. Mr. Schanschieff passed away on Saturday last after a short illness, at his residence, North View, Marriott Street, Northampton. The works of the company were closed on Tuesday, the day of the funeral. The deceased gentleman was a son of the late Mr. A. Schanschieff, so well known in London many years ago as a battery inventor and expert.

Mr. S. Aspen.—The death is announced of Mr. S. Aspen, who was for many years connected with the Scarborough Tramway Co., of which he was a director. He was 72 years of age.

Mr. W. Chadburn.—*The Times* records the death, on April 3rd, of Mr. William Chadburn, chairman of Chadburn's (Ship) Telegraph Co., Ltd., in his 84th year.

Mr. R. Crush.—The death has occurred, at the age of 68 years, of Mr. Robert Crush, who was for a number of years on the staff of the Electric Supply Corporation at Chelmsford.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Frigidaire, Ltd.—Incorporated outside the United Kingdom. Particulars filed on March 24th. Capital is $25,000 (United States) in 250 shares of $100 each. The company was incorporated in Canada on September 1st, 1926, to manufacture and deal in mechanical and electrical devices, machines, engines, refrigerators, appliances and apparatus of all kinds, especially pumps, washing machines, and other household devices, &c. The chief place of business is at Toronto. British address: Imperial House, 19, Kingsway, W.C.2. H. L. McGurk is authorised to accept service of process and notices on behalf of the company.

W. Hammerl & Co., Ltd.—Private company. Registered March 28th. Capital, £600 in £1 shares. Objects: To carry on the business of manufacturers, importers, exporters, and repairers of and wholesale and retail dealers in all kinds of electric and other lamps, and apparatus for wireless telegraphy and telephony and television, &c. The first directors are:—W. Hammerl, 56, Minster Road, West Hampstead, N.W.2; H. J. McCarthy (permanent), 23, Staverton Road, Brondesbury Park, N.W.2. Secretary: M. J. McCarthy. Solicitors: Romain & Romain, 132, Seymour Place, Bryanston Square, W. Registered office: 4, Norfolk Mews East, Paddington, W.1.

Radio Investigations, Ltd.—Private company. Registered March 29th. Capital, £90 in £1 shares. Objects: To assist in and finance, research, investigation, inquiry into and experimenting upon, developing and perfecting all matters connected with electrical and photographic knowledge and apparatus in connection with such matters, including wireless transmitting and receiving apparatus, kinematograph films, &c. The subscribers (each with one share) are:—L. A. Levy, D.Sc., 31, Shoot-up-Hill, Cricklewood, N.W.2; D. W. West, 5, Shalimar Gardens, Acton, W.3, research chemist. Solicitors: Oliver Richards & Park, 1c, King Street, St. James, S.W.

Partridge & Mee, Ltd.—Private company. Registered March 31st. Capital, £4,000 in £1 shares. Objects: To carry on the business of manufacturers and importers of and wholesale and retail dealers in all kinds of electric telephones and telegraphs and all apparatus used for and connected with the transmission and reception of telephonic, telegraphic and radio telephonic and telegraphic communications, &c. The first directors are:—C. A. F. Partridge (chairman), 6, Clarendon Park Road, Leicester; S. N. S. Mee, 48, Queen's Road, Leicester; V. F. Hewitt, Budden Lane, Quorn, Leics. The first two named are permanent. Solicitors: Stone, Davis, Savage & Partridge, 4, Welford Place, Leicester.

C. P. Ribton, Ltd.—Private company. Registered April 1st. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, mechanical, and general engineers, manufacturers of and dealers in engineering plant and accessories, dealers in motor vehicles, machinery, &c. The subscribers (each with one share) are:—P. A. C. Ribton, 34, Allington Street, Liverpool, electrical engineer; Mrs. A. Ribton, 34, Allington Street, Liverpool. P. A. C. Ribton is the first director. Registered office: 44, South Castle Street, Liverpool.

Jays & Co. (Engineers), Ltd.—Private company. Registered April 1st. Capital, £700 in £1 shares. Objects: To carry on the business of general and electrical engineers, lubricating ring and general manufacturers, &c. The first directors are:—W. Hinson, 25, Irving Street, Edgbaston, Birmingham, engineer; H. Hinson (same address), engineer. Qualification: Two shares. Registered office: 188a, Bromsgrove Street, Birmingham.

Baird Television Development Co., Ltd.—Public company. Registered April 1st. Capital, £125,000 in 100,000 10 per cent. preferred participating ordinary shares of £1 each and 500,000 deferred ordinary shares of 1s. each. The objects of the company are to test, exploit, exercise, develop, manufacture, exhibit, use, let out on hire, grant licences in respect of, sell, and generally turn to account and trade with inventions relating to a system of transmitting views, portraits and scenes by telegraphy or wireless telegraphy, &c., and to enter into certain agreements, the parties to which are not named. The minimum cash subscription is 7 shares. The first directors (to number not fewer than 3 or more than 8) are:—Sir Edward Manville, Kt., 3, Whitehall Court, S.W. (chairman of Daimler Co., Ltd.); Sir James C. Percy, Kt., "Ardenvohr," Cowper Road, Dublin (chairman, Sackville Press); F. R. A. Shortis, Firfield, Weybridge, banker; J. L. Baird, 975, Finchley Road, N.W., inventor (director of Television, Ltd.); O. G. Hutchinson, 87, St. George's Road, S.W. (director Television, Ltd.). Subject to any contract or appointment made, and to the maximum number of directors fixed as above, Television, Ltd., shall, being by itself or its nominees the holder of 300,000 deferred ordinary shares, have the right at all times to nominate and appoint half the directors. One of the directors so nominated and appointed shall, if required by that company, be chairman. Qualification (other than O. G. Hutchinson and J. L. Baird, whose qualification shall be £100): £500 shares. Remuneration: £300 each per annum (chairman £100), free of income tax. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, W.C.

Official Returns of Electrical Companies.

Radions, Ltd. — Mortgage debenture dated March 8th, 1927, to secure £800, charged on the company's undertaking and property, present and future, including uncalled capital (ranking *pari passu* with debenture for £1,200 issued October 26th, 1926). Holders: R. Dobson and R. T. Hindley, Mosley Street, Manchester.

Windsor Electrical Installation Co., Ltd.—Satisfaction in full on March 9th, 1927, of mortgage dated March 11th, 1902, securing £20,000.

A. E. Tribe & Co., Ltd.—A. E. Tribe, of 18, London Street, Basingstoke, ceased to act as receiver on March 24th, 1927.

Allen, West & Co., Ltd.—Capital, £150,000 in £1 shares. Return dated February 22nd, 1927. 141,724 shares taken up. £141,724 paid. Mortgages and charges, £60,000.

Electric Advertising Clocks, Ltd. — Capital, £36,000 in 30,000 ordinary shares of £1 each and 120,000 deferred shares of 1s. each. Return dated January 6th, 1927. 27,492 ordinary and 120,000 deferred shares taken up. £8,600 paid (being 10s. per share on 17,200 ordinary shares). £16,292 considered as paid (being £1 per share on 10,292 ordinary and 1s. per share on 120,000 deferred). Mortgages and charges, nil.

General Cable Manufacturing Co., Ltd.—Particulars filed of £60,000 debentures authorised March 18th, 1927, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued. Also registered, a debenture of same date to secure £10,000 with a bonus of £1,000, charged on the company's property, including uncalled capital, subject to above debentures. Holder: H. Bisseker, c/o E. G. Bisseker, 1, Balderton Street. Satisfaction in full on March 18th, 1927, of debentures dated October 26th, 1923, and January 2nd, 1924, securing £20,000 and £5,000 respectively.

B. A. Manufacturing Co., Ltd.—Issue on March 23rd, 1927, of £500 debentures, part of a series already registered.

City Notes.

English Electric Co., Ltd.

The annual meeting was held on March 30th, Mr. P. J. Pybus presiding. In moving the adoption of the report, the chairman said that while the industrial disputes were not the sole cause of their troubles, no group such as theirs could operate profitably under the labour conditions which dislocated their shops for the major portion of last year. Having referred to some of the principal items in the balance sheet, he said that the continued existence of unbridled competition for export work had also been a disquieting feature of the year. Not only their company, but other British companies engaged in the manufacture of heavy electrical plant, starting with the laudable object of defeating the foreigner, had too often found themselves defeating one another in a race for extra output as a corrective for too low prices. Competition in the heavy electrical industry had been carried to a point of wastefulness, and was, from the national point of view, a costly rivalry. That was now generally recognised, and it was to be hoped that some arrangement would be made by which the destructive internecine competition between all the principal companies engaged in the heavy trade for foreign work could be reduced. It needed but a small increase of the selling prices of their invoices for export—certainly not more than three per cent.—to change entirely the result of a year's trading, and to put the heavy business on to a reasonably sound footing. That fierceness of competition was partly a legacy of the war, and the optimism which followed its conclusion. By the amalgamation of 1918 they secured six businesses with works at Preston, Coventry, Stafford, Rugby and Bradford. At two of those works considerable extensions were already in hand at the time of the amalgamation. The optimism of 1918 affected almost every type of business, and they, in common with many other concerns, set out to re-equip their shops for what had so far proved to be an output which they could not secure. Lack of purchasing power abroad, combined with the surplus of producing capacity at home, had brought down prices from two-and-a-half times above pre-war to a point at which, in certain cases, they were little more than 25 per cent. above pre-war. By the end of 1921 it became obvious that not only was the producing capacity greater than the orders necessary to fill it, but that the selling price and consequent gross margin of profit were falling with unexpected rapidity. In February, 1922, a drastic scheme of re-organisation of the works was put in hand and rigid economies were enforced. One great works was closed down, the manufactures of the others were grouped according to type and size, and each works undertook the manufacture of one class of goods, in order to secure for each plant as much repetition work as possible. Then, to effect another economy, the de-centralisation of the London technical organisation to each works was undertaken as far as possible. That was fully completed last November, and the major activities of each works were now concentrated at that centre. The last phase of reconstruction and economy, most of which would have effect during the current year, would bring down expenses to an absolute minimum, and would give them a reasonable expectation of orders at a profit. While they hoped to increase their home business, they were obtaining a fair share of it, but the necessity of filling their works and covering their overhead charges made it essential for them to secure a large amount of export trade. The company depended almost exclusively on orders for heavy electrical and mechanical plant. It did not manufacture cables, lamps or wireless equipment. The prosperity which those light and ancillary products were at the moment enjoying in this country and in America, thanks to a strong patent position or some other cause, had probably tended to reduce price levels in the heavy engineering side, particularly in the export trade. That was, in his opinion, the only explanation of the absurd prices quoted for railway electrification and similar installations in foreign countries and our own Colonies. They had examined each of those ancillary businesses on which, for the moment, the margin of profit was considerable, and were still looking into many more developments; but in general principle they had felt that their only sound course was to concentrate their energies and resources towards a perfecting and extending of the business which they inherited, which they thoroughly understood, and for which their works were specially designed and laid out. Notwithstanding this policy they were constantly seeking for new outlets, directly or indirectly, ancillary to their main operations, and several lines had been developed and were now at the stage of financial success. For instance, the ordinary Diesel and semi-Diesel engine had been established for many years, and was the object of fierce competition. They felt that, if they could develop a new type of oil engine which could safely be carried into sizes larger than was possible with the ordinary Diesel engine, they could secure a market in which there were fewer competitors. That was actually what had happened with their Fullagar engine, and to-day they stood in an unrivalled position in that particular class of work.

That engine was operating with great success in waterless oil fields, in the Sudan, in the Colonies and at home. Thirty-five per cent. of the business consisted of repeat orders. Again, the company had entered the water-wheel business, partly for itself and partly for the orders for electrical plant which it carried with it. In 1922, American competition practically destroyed other British competition, and to-day they stood in the position of being the only British manufacturers capable of producing large water-power units complete with their electrical adjuncts. In conclusion, Mr. Pybus expressed his confidence for the future. A large increase in the electrical business, which had been too long delayed, could not be indefinitely postponed. Delayed legislation in this country and lack of purchasing power abroad had reduced demand and increased competition. That condition could not be permanent, and with a revival in trade should come a fair world selling price. Their works were never in better shape nor their products so good. Their expenses had been reduced enormously, and were still coming down. New types of manufacture had been perfected, new markets had been opened up and were rapidly being consolidated. Their products were well known and favourably regarded all over the world. Further, if to their present large order book they added a very conservative amount for the normal everyday business on which they might rely, that would suffice to keep four out of their five works employed for the remainder of the year. The report and accounts were adopted.

County of London Electric Supply Co., Ltd.

This company's report for 1926 was reviewed in our issue of March 18th (p. 443). The annual meeting was held on March 29th, when Sir Harry Renwick (chairman), in the course of his speech, referred to the capitalisation of £1,773,334 of the reserves and its distribution as ordinary shares. The company's revenue had been adversely affected by the industrial troubles of the past year. Preparations had been made for the supply of electricity to large power consumers who had been unable to take the supply until a much later date than had been anticipated. In addition to that the company had had to pay exorbitant prices for coal, some of which was of very inferior quality. Dealing with the question of the allocation of capital and assets as between the inside and the outside areas, the chairman said that the provisions of the London Electricity (No. 1) Act, 1925, as to sinking funds, standard price and dividends, did not apply to the outside areas, and profits received from those areas would go to swell the profits of the company, and should be available to increase, if desirable, the dividends over and above the standard fixed by the Act. The dividend for the past year was equivalent to 16¾ per cent. on the old capital, as compared with 15 per cent. for 1925. The authorities had had to agree to the company's schedule of values of assets and they had practically accepted the value shown in the company's books, which meant that the plant was modern and up-to-date. During the year the company's holdings in the South Metropolitan and South London Companies were increased by those companies' bonus issues; further advances towards extensions were made to a subsidiary company. The balance of the reserves remaining was £130,649; that belonged to the shareholders as part of the undistributed reserves. At the beginning of the year the company had reduced its rates for supply by 10 per cent., but that decrease had to be rescinded. After reviewing the accounts, the chairman pointed out that it would not be necessary in future to make provision for depreciation on the same lines as previously, as the matter was dealt with by the sinking funds established by the Act. He pointed out that, in spite of the troubles of last year, progress had been made, and said that an additional area of 33,000 acres with a population of 75,000, had been opened up by the company's distributing mains. It was hoped to have the new Barking extensions ready for service this year, but their calculations had been upset. Referring to the Electricity (Supply) Act, 1926, Sir Harry said that it undoubtedly had great possibilities for good; the Act as passed was a great improvement upon the original Bill. It behoved all who had the interests of the supply industry at heart to co-operate with the Central Board to make the Act a success. By a "sentimental side issue" the Bill for the extension of the company's powers in Essex was defeated in the House of Commons; a less controversial Bill was being promoted. To show that the companies were working in accordance with the spirit of the London Electricity (No. 1) Act, 1925, Sir Harry mentioned that the generating stations of the group had been interconnected and also that the Barking station had been linked up with the North Metropolitan Company's Brimsdown station and the Kent Power Co.'s station at Rochester. After mentioning the social activities of the staff and the acquisition of new premises, the chairman said that the prospects were never brighter and they looked for largely increased output and revenue. The report and accounts were adopted.

British Electric Transformer Co., Ltd.

The annual meeting was held on March 29th, Mr. A. F. Berry presiding. In moving the adoption of the report (ELECTRICAL REVIEW, March 25th, p. 488), the chairman, after referring to the loss which the company had sustained during the year by the deaths of his brother, Mr. George Berry, who had been a member of the board and manager since 1907, and Mr. Roothaan, one of the oldest engineers in the company's service, said that the net profit had increased by 12 per cent. It was proposed to pay 12 months' dividend on the cumulative preference shares, bringing the dividend up to date, and 5 per cent. on the ordinary shares. Mr. Berry said that 1926 had been the most difficult year of a bad series. Referring to the general strike, he said he need hardly say that practically the whole of those employed by the company did their utmost to help the community. The long drawn out coal strike caused them the gravest anxiety with regard to supplies of raw materials, and the consequences of the bitter fight would be felt for a long time by many industries, including their own. There were, however, some hopeful signs and illuminating rays among those dark clouds. Having at last seen their error, millions in this country had tightened their belts and now endeavoured to do their day's work more cheerfully. The question before them always at their works was how to get orders and execute them so quickly and well as to ensure future business. The competition in the engineering world was both national and international. There was an effect of the coal strike upon the junior branch of their business to which reference should be made. For many years the company had led a campaign in favour of electric heating and cooking. They knew that the more they could stimulate the orders for electric heating and cooking apparatus the larger would the need for transformers become. Their electric cookers, fires, radiators, kettles, toasters, &c., had steadily been improved, and as a result of much demonstration work and publicity, the public turned to them when coal was almost unobtainable. Their entire output was taken through municipal and other supply authorities and greatly appreciated by thousands of householders. The effect of the extended use of electricity for domestic and kindred purposes consequent upon the coal strike would undoubtedly be very marked in the near future. They were taking steps to care for both the publicity and output sides of that business during this year. It was hoped that early next year, if not before, they might reap substantial benefit as the result of their efforts. The "Tricity" Restaurant, which did excellent service as purveyor and propagandist at Oxford Street, succeeded in making the premises which it occupied too valuable for retention as a restaurant. A new "Tricity" Restaurant in the Strand had been opened. They intended to open showrooms in the same building block, and he had no doubt of the ultimate success of this branch of their sales business.—The report was adopted.

London Electric Supply Corporation, Ltd.

The annual meeting was held on March 31st. Mr. R. H. Benson (chairman), in moving the adoption of the report (*vide* our last issue, p. 528), said that notwithstanding the adverse conditions of the past year, the company's profit had only declined slightly. After referring to the issue of £199,800 of the reserves as bonus shares, Mr. Benson said that the demand for energy continued to increase, and the year's output was over 45 per cent. above that of 1925. The average revenue per kWh had decreased by 9 per cent. The high cost of fuel and rates had had a marked effect upon production costs. The amount of rates paid had increased from £39,783 in 1925 to £76,586 last year—an increase of over 90 per cent.; that figure would be still further increased in the current year. The amount paid represented over 10 per cent. on the whole of the ordinary share capital, and with coal at normal prices was over 30 per cent. of the works costs. The supply to the Southern Railway had materially increased during the last few months. In future, the London Power Co., of which the company was a constituent, would supply the whole of the company's requirements and those of nine other constituent companies. During the general strike 85 per cent. of their men left work, but with the assistance of the remainder of the staff and volunteers the company was able to maintain a full supply. Mr. Benson referred to the Electricity (Supply) Act, and said he hoped that the London companies would be allowed to carry out the obligations under their own Acts without hindrance. If they were, he felt confident that they would combine to assist the Central Board in its task of unifying and consolidating electricity supply. During the past year the company had concentrated to a greater extent upon the development of its residential area, and considerable extensions of mains were made. The public was beginning to realise that the adoption of electricity had many advantages of which it was previously unaware, and the company hoped to obtain increased revenue from domestic consumers within the next few years. With regard to the current year, he thought that, given industrial peace, output and revenue should greatly increase.

Clyde Valley Electrical Power Co.

Among the matters referred to by Sir Frederick Gardiner, K.B.E., at the annual meeting on March 30th, were the passing of the Electricity (Supply) Act and the constitution of the Central Electricity Board. With regard to the Bill he confined himself to expressing the hope that the Central Board would examine and weigh each proposal with great care in order to ensure that the results likely to be attained were commensurate with the expenditure involved. There was reason to believe that a scheme for Scotland would be published without delay, shortly after Easter. The directors would receive it with sympathy, but it would be their duty to subject it to thorough examination. They sincerely trusted that it might be found to further public interests, and that it would deal equitably with the shareholders and consumers of that

company. Should they be disappointed in that regard, the directors would naturally feel bound to take all steps open to them to protect the interests confided to their care. That was the policy they had always pursued, and the company would not fail to discharge its obligations to the area it served. After dealing with the difficult conditions caused by the coal stoppage, Sir Frederick said the company had not lost its vitality. Large sums still fell to be spent under the head of "mains," so that in the area entrusted to their care the demand for electricity might be fully met. As the demand grew additional generating plant would be required, but when and where the plant was to be installed was a matter which would largely be decided by the Central Electricity Board. Work on the hydro-electric scheme at the Falls of Clyde had been delayed. It was expected, however, that the plant would be completed in time for next winter's load. In conclusion, the chairman said that if the energy which was at present devoted to domestic conflict were spent in a united endeavour to recover our trade, he did not doubt that they would find ample reward. He had too much faith in the inbred sagacity and commonsense of all classes of the people to believe that they would continue to be led astray from their plain duty and obvious interest.

Charing Cross Electricity Supply Co., Ltd.

Mr. W. F. Fladgate (chairman) presided at the annual meeting on March 30th, and prefaced his speech with congratulations to Mr. J. M. Gatti upon his appointment as chairman of the London County Council. Dealing with the report (Elec. Rev., March 25th, p. 485), Mr. Fladgate said that although there had been an increase in the sales of energy of 9¼ million kWh, most of the increase was attributable to two large bulk supply consumers—the Metropolitan Electric Supply Co. and the Post Office. The receipts were about the same as in 1925, but it should be borne in mind that substantial reductions had been made in the charges. The chairman then dealt in some detail with the capitalisation of the reserves, &c., and pointed out that the company had only earned about sufficient last year to pay the standard dividend, but the conditions in 1926 were not normal. Efforts were being made to improve the distribution system. A new 1,500-kW automatic sub-station was started up in October last to supply the electricity required in the Soho Square area; that was the first station of its kind in London, and the first anywhere which was entirely underground. A saving of 8 per cent. in the distribution losses had thus been made. In conclusion, the chairman thanked those of the staff who loyally remained with the company during the general strike. The report and accounts were adopted.

Ericsson Telephones, Ltd.

The annual meeting was held on March 30th under the chairmanship of Mr. W. M. Crowe, who, in presenting the report and accounts (Elec. Rev., March 25th, p. 486) expressed the directors' regret at the recent death of Mr. L. M. Ericsson. He said that the issue of about £100,000 seven per cent. cumulative preference shares had met with success; and he also referred to the issue of £200,000 of ordinary shares as a bonus. Their associated company would soon be placing some surplus ordinary shares on the market and permission to deal in those shares had been granted on the Stock Exchange. The results of the past year were highly satisfactory in view of the extremely difficult nature of the period. The future was not altogether free from clouds; the air had to be cleared of the mistrust and suspicion which marred the past year, and it had to be realised that capital and labour were interdependent and not antagonistic. Telephone expansion in this country reached a record level last year, but there was tremendous scope for still greater progress. Orders received during the current year were encouraging, although prices were lower. One important development was the changing over to the automatic system. The company had made a study of this branch and had recently received a number of contracts for automatic exchanges, and further orders were hoped for. The report and accounts were adopted.

Anglo-Portuguese Telephone Co., Ltd.

Viscount St. Davids (chairman) presided at the annual meeting last week, and in presenting the report and accounts (*vide* our last issue, p. 528) said that the company had a bad record as a payer of dividends. Since an interim dividend in 1920, nothing had been paid until last year, when they were able to distribute 7 per cent. In 1924 and 1925 the profits made were used for capital expenditure. Last year, however, they raised their capital and freed themselves from that position. Little damage was done to the company's property during the Portuguese disturbances in February, and the company had done useful work in maintaining communications. They had been in negotiation with the Portuguese Government for a new or extended concession. After about 12 or 18 months, further capital would be required, and the raising of the necessary amount depended upon an extension of the concession. At the present time the company had issued £300,000 on debentures, while £100,000 remained unissued. All the loans had been paid off, and the old 5 per cent. first debentures and extension debentures would be cleared off by May next. The standard rate of dividend for telephone companies was considered to be 8 per cent., and they hoped to reach that rate next year. The report and accounts were adopted.

Lancashire Dynamo and Motor Co., Ltd.

The report for 1926 states that the company's sales were greatly curtailed by the coal dispute; the profit was reduced from £20,201 to £6,801. As the provision for taxation has proved greater than necessary, a part of it (£15,000) is put to the credit of the profit and loss account. Including this and the balance of £2,147 brought forward, the amount available is £23,948. From this the preference dividend and directors' fees are paid, £10,000 is transferred to reserve (making £75,000), an ordinary dividend of 5 per cent. is to be paid (as compared with 7½ per cent.), and £4,128 is carried forward. During the year an agreement for taking over the Crypto Company by an exchange of shares was concluded and powers have been taken to create the additional shares required. The two companies have worked amicably together for seven years and the complete fusion is expected to be still more advantageous. Mr. F. J. West has been compelled by pressure of other business to resign from the board. Mr. S. G. Shaw, the representative on the board of the Crypto Company, vacates his position owing to the amalgamation, but he and his brother (Mr. C. R. Shaw) have been elected directors.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The annual meeting was held on March 25th, Mr. E. Lloyd Pease presiding. The chairman said that no new development had been undertaken during the year. The instalments received during the year in respect of the purchase of the stations under the agreement which was entered into in 1922 amounted to £21,478; the total unredeemed capital expenditure was £219,193. Their investments had been increased by £18,360 and this had been invested in 3½ per cent. Conversion Loan. The total investments were £142,862 and the income therefrom for the year was £7,313, or £1,000 more than last year. The decrease in revenue, due to the reduction in the output from the power stations, was £4,700. All their stations were shut down completely immediately after the commencement of the strike in May and continued so until the end of November or the middle of December. One station, at Weardale, using surplus gas and waste heat from coke ovens, had not yet been commercially started up. The present outputs of the stations were good and the indications were that they would continue to be so during the year.

British Aluminium Co., Ltd.

Speaking at the annual meeting, on March 31st, Major R. W. Cooper, O.B.E., M.C., said that the general strike and coal stoppage had affected every branch of the business, causing a fall of over £100,000 in the net profit. In certain directions the demand for aluminium had developed, particularly in the electrical industry, whose demand last year was double that in 1925. That was the result of the continued good service of aluminium in practice. It was anticipated that the Electricity (Supply) Act would stimulate the use of aluminium for electrical purposes. Other favourable developments occurred in the use of the metal for engine work and domestic utensils. The civil engineering work on the Lochaber hydro-electric scheme was progressing, and during the past year actual tunnelling operations were commenced. The pier to serve the aluminium factory had been completed and the factory and power house foundations had been commenced.

A. Reyrolle & Co., Ltd.

The report for the past year shows a profit of £83,351 (against £70,621 in 1925), to which is added a net amount of £29,123 brought forward, making £112,474. After transferring £15,000 to the reserve account and meeting the preference dividend, it is proposed to pay a dividend of 12½ per cent. on the ordinary shares, as in 1925, leaving £49,674 to be carried forward. The capital expenditure during the year was £19,098, mainly upon machine tools. The report records the death of Mr. W. Negus, who had been a director since the formation of the company, and the appointment to the board of Messrs. F. Coates and H. W. Miller, who have held responsible positions with the company for a number of years. The meeting was to be held yesterday (Thursday).

Gateshead and District Tramways Co.

The total revenue for the past year was £125,611 (as compared with £138,448 in 1925), and the balance on the year's working was £18,235 to which is added £31,410 brought forward, making £49,645. After providing for mortgage redemption and preference dividends, it is proposed to pay a dividend of 10 per cent. on the ordinary shares and to carry forward £23,342. The report says that the traffic receipts fell by 9 per cent., while the local rates payable by the company increased by 49 per cent.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

Col. R. E. Crompton, C.B., presided at the annual meeting on March 31st, and in presenting the report, which was reviewed in our last issue (p. 528), said that during the past year it was hoped to devote a great deal of effort to the further development of the company's domestic business, as distinct from lighting, but the financial rearrangements had absorbed the attention of the staff and the board. In the company's case that matter was complicated by the fact that it was not sole owner of the Wood Lane works. Even now the standard price had not been fixed, and while the company was paying the standard dividend for 1926, he could not say what would be paid for the current year. The indications of increasing

demand were very encouraging. The effects of the coal dispute had been to increase the cost of coal, and the restrictions imposed almost nullified the increase in output which was anticipated when the charges were reduced at the beginning of the year. The output had risen by only 3.15 per cent., and the average revenue per kWh had fallen from 3.21d. to 3.03d. Col. Crompton thought that the industrial outlook was favourable and referred to the establishment of a pension fund for the company's employés.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Folkestone Electricity Supply Co., Ltd.—40,000 new ordinary shares of £1 each 4s. paid, Nos. 100,001 to 140,000.

North Wales Power Co., Ltd.—59,918 ordinary shares of £1 each fully paid, Nos. 323,966 to 383,883.

Application has been made to the Committee to allow the following to be officially quoted :—

Atlas Light and Power Co., Ltd.—£889,757 5 per cent. debenture stock.

Ericsson Telephones, Ltd.—99,980 (cumulative 7 per cent.) preference shares of £1 each fully paid, Nos. 200,001 to 299,980.

River Plate Electricity Co., Ltd.

To a net revenue of £49,249 for 1926 is added £7,318 brought forward, making £56,567. It is proposed to pay a final dividend of 8½ per cent. on the ordinary stock, making 11½ per cent. for the year, to transfer £6,555 to general reserve, and to carry forward £7,576. During the year 34,669 £1 ordinary shares were issued to shareholders as a bonus, and 1,318 shares were sold at a premium of £1,412, which has been transferred to reserve, making the latter £353,000.

Peterborough Electric Traction Co., Ltd.

The revenue during the past year increased by £7,299 to £40,536. The net profit rose from £3,508 to £5,618, and the addition of £2,203 brought forward makes £7,821 available. From this £251 is paid in staff bonuses and a dividend of 10 per cent. is paid on the ordinary shares, leaving £3,825 to be carried forward.

Midland Electric Manufacturing Co., Ltd.

The net profit for 1926 amounts to £20,010. The preference dividend is paid, £3,585 is written off preliminary expenses, £10,000 is transferred to reserve, and after paying an ordinary dividend at the rate of 7½ per cent. per annum, £4,454 is to be carried forward.

Tynemouth and District Electric Traction Co., Ltd.

The revenue for the past year was £46,563, and after meeting expenses, including £5,000 for renewals, there remains £2,840 to which is added £2,369 brought forward, making £5,209. It is proposed to pay an ordinary dividend of 5 per cent., and to carry forward £1,364.

London Electric Wire Co. & Smiths, Ltd.

Out of the profits of the past year the directors have placed £25,000 to contingency reserve, and after paying the preference dividend propose a final distribution of 6½ per cent. on the ordinary shares, making 7½ per cent. for the year. A balance of £23,480 is carried forward.

Reduction of Capital.

C. A. VANDERVELL & Co., LTD., & REDUCED.—A petition for the confirmation of the special resolutions reducing the capital of this company from £350,000 to £175,000 has been presented to the High Court, and will be heard in London on April 26th.

Babcock & Wilcox, Ltd.

A final dividend of 8 per cent., free of tax, has been declared on the ordinary shares, making 13 per cent., free of tax, for the year. A similar payment was made for 1925, but 3 per cent. was included as a bonus.

Jarrow and District Electric Traction Co., Ltd.

The revenue for 1926 was £9,879, and after meeting expenses and adding £1,596 brought forward, the balance available is £1,724, which is to be carried forward.

Metropolitan-Vickers Electrical Co., Ltd.

The annual meeting was held on Tuesday last; a report of the proceedings will appear in our next issue.

German Companies.

The *Electricity Supply Co.*, Berlin, reports a successful year. Special efforts were made to extend the use of electricity in agricultural operations and for domestic use. The dividend is increased from 9 per cent. to 10 per cent.

The *Saxony Works, Light and Power Company*, reports that the degree of activity in the electrical industry was less than in 1925, and competition increased. Considerable economies were realised through the "rationalisation" of working. The dividend is 6 per cent., as in 1925.

The *Berlin Elevated and Underground Railway Company*, which increased its share capital by 62,000,000 marks to 175,240,000 marks last year for the purpose of taking over the North-South railway and the Schoneberg line, reports net profits amounting to 8,010,000 marks for 1926, as compared with 8,810,000 marks in the previous year, and the dividend is reduced from 7 per cent. to 5 per cent. The number of passengers carried increased from 163.18 millions in 1925 to 172.53 millions last year.

Correction.—The domicile of Brown, Boveri & Co., mentioned in our last issue, is Mannheim, not Baden, as stated.

Belgian Companies.

The *Société Belge pour la Fabrication des Câbles et Fils Electriques* reports that all the fixed property has been written off. The gross profits amount to 2,774,000 fr. The dividends are at the rate of 34.41 fr. per ordinary share (against 25.45 fr.), and 47.14 fr. per tenth founder's share (compared with 25.35 fr.).

The *Société de Constructions Electriques de Belgique* reports a net profit of 1,671,000 fr. for 1926, which has been carried forward. With a view to opening up markets, the report states that a considerable stock of motors was formed and many depôts were established to permit immediate delivery. The sales progressed despite keen competition. A special department has been established for export trade.

Stocks and Shares.

MONDAY EVENING.

THERE is not a great deal in the present financial outlook to cause any animation in Stock Exchange markets. The continued easiness of money is an encouraging factor, and it is taken for granted in the City that the 5 per cent. Bank rate, which has been in force since December, 1925, would have been reduced, before this, to 4 per cent., had it not been for the trouble that has arisen in China. Were the Far-Eastern cloud to become dissipated, the outlook for cheaper money would be immediately brightened, and, with this in prospect, investment securities maintain a tolerably firm front notwithstanding the expectation that the Chancellor may have something unpleasant to announce in regard to Budget legislation. Any sort of tax upon income, estates, or legacies is a bear point for gilt-edged securities. Curiosity is agog to hear how the Chancellor will deal with the deficit of 36½ millions for 1926-27, and how he will provide for the nation's needs in the current year.

Electricity supply shares show a good deal of firmness, but rises in prices are mainly confined to the shares of the provincial power companies to which attention has been recently drawn here as likely to prove profitable investments from the point of view of the future. Metropolitans gained 1s. for reasons discussed a fortnight ago. Clyde Valleys are 1s. better, so are Lancashire Light & Power and Newcastle-on-Tyne ordinary. The Newcastle company reduced its dividend by 2 per cent. to 5 per cent. for 1926 as compared with 1925, but the decline was due, as the report showed, entirely to the labour conditions that ruled during last year, which can scarcely be expected to recur. The profit for 1926 of £371,700 went against £507,500 in the previous twelve months, which latter is a fairer criterion of the earning capacity of the company than is the former, and, with profits of half-a-million a year, the company can pay 7 per cent. with ease on its ordinary shares. The current price of 22s. 6d. implies that the 7 per cent. dividend is regarded as a better standard of expectation than 5 per cent., for the yield on the present basis of dividend is under 4½ per cent. on the money, whereas Lancashire Light and Power yield 5¼ per cent.

Midland Counties ordinary are in favour, the return in their case being £5 6s. 8d. per cent. on the money. The company is considered to be very well situated for the obtaining of fresh business on a large scale. Its profits last year showed an increase of £16,000 in spite of the industrial state that prevailed, and 6 per cent. was paid on the ordinary shares for the third year in succession. A new issue was made last year, the expenses in connection with which were written off in last year's accounts. The yield is sufficiently modest to imply anticipation of an increased dividend in the comparatively near future.

The strength recently shown by Underground Electric Railways of London £1 shares, and which has raised the price to 16s., has had the effect of directing somewhat specialised attention to the shares of the London tramways companies. We say specialised attention, because many people decline point blank to see any future at all for tramways, except that of the scrap heap. They maintain that investment of money in tramways shares is simply a loss to hospitals or other institutions where the money would prove of some service. On the other hand, the people who adopt the opposite viewpoint to the substantial stake that the L.C.C., to take one authority alone, has in the tramways, contending that it is impossible to imagine the L.C.C. consenting to cut such a loss as would be involved by giving up trams altogether. If the L.C.C. continues with its tramways, then the private companies may be assumed to have a sporting chance of success.

The recent endeavours, evidently quite sincere, that have been made to deal with the London transport systems and to restrict extravagant competition, are held to point to what may be expected in the future. A less haphazard method of traffic direction already prevails, and it is claimed that a purchase of ordinary shares in the London United Tramways, London & Suburban Traction, and one or two others of similar nature, will result in the speculator

doubling or trebling his money within the course of the next few years. The theory has something to recommend it, though not to the man who will only put money into a speculation on the idea that his purchase of this morning must show him a profit in the afternoon of the same day.

The Metropolitan-Vickers net profit for last year came to £179,675, a figure curiously close to the net profit in each of the two preceding years, £178,167 for 1925, and £178,808 in 1924. The price of the shares remains at 28s. 9d., at which the return on the money, on the 8 per cent. dividend, works out to £5 11s. 4d. Johnson & Phillips have weakened to 2 7/16, showing a drop of 3s. 9d. on account of pessimistic dividend forecasts. The rest of the list of manufacturing shares is steady. British Insulated have recovered to 3½. Babcock & Wilcox are unchanged, in the engineering group, at 52s. 6d. The previous dividend of 13 per cent. free of tax is repeated.

The London Electric Wire Company and Smiths made a profit of £90,900 for last year, from which the directors have taken £25,000 to place to special reserve for contingencies. The profit is about £6,600 less than that of the previous twelve months, but the dividend on the ordinary shares is maintained at 7½ per cent. The price of the 7½ per cent. cumulative preference shares is 23s. 9d., and the ordinary, which rarely change hands, stand at 26s. 9d.

In the foreign traction group, Anglo-Argentine Tramways are again better, the first preference improving to 3¾, while the second preference retain their last week's advance at 3 5/16ths. A good many holders must now be able to secure good profits by selling at to-day's level, and, in spite of the high return which the shares offer, it might be worth the proprietor's while to sell his shares and to take advantage of the improvement that has lately occurred. Possibly the outlook is as bright as optimism declares it to be, but, in the continued state of uncertainty which surrounds the company's affairs, the acceptance of a handsome profit may be discreet.

The Montevideo Telephone Company announces to its shareholders that an offer of £2 per share has been made, by a purchaser whose name the Board does not disclose. The directors advise acceptance of what they consider to be a good price, but the uninformed proprietor naturally asks why he is not given more information. The supposition is that an American, or an American group, inspires the offer, and, if this is correct, the natural question again is: Why? As the shares were quoted not long ago in the neighbourhood of 30s., the bid of £2 looks handsome, and it piques curiosity as to the reason for this offer from someone whose identity is not disclosed. Oriental Telephones are rather easier at 52s. Chili Telephones have gone back to 6½. In the cable list the changes are of no particular consequence.

A well-known firm of Stock Exchange dealers has issued a brochure entitled "Submarine Cables and Wireless Developments, 1927," giving extracts from the report of the Mackay Companies. The intention is not to belittle the achievements or value of radio, but to allay apprehension on the part of shareholders in the cable undertakings. "Had wireless been discovered first," say the authors, "cables would have been welcomed as an improvement." The remarkable financial strength of the Eastern cable companies is set out as follows:—

Company.	Years.	*Net Profit.	To Reserve.	Ordinary Dividend 10 per cent. Free of Tax.
		£	£	£
Eastern	1922	847,248	400,000	500,000
	1925	1,044,399	500,000	
Eastern Extension	1922	724,802	250,000	400,000
	1925	851,294	450,000	
Western	1922	547,518	250,000	311,895
	1926	590,626	250,000	

*Net Profit is calculated after allowing for Income Tax, Debenture and Preference Interest.

The statement made six weeks ago by the President of the Mackay Companies is then quoted. The argument is that neither the "Beam" system nor the transatlantic telephone service is likely to have any real effect upon cable business, and this is the view consistently taken for the past twenty years by those of us who consider that there is ample room for all the various systems. The cable companies have gone steadily ahead. Marconi shareholders have suffered continual disappointments of late years, but the result of the meeting on the Tuesday in this week should prove the foundation of future prosperity. The price of Marconis remains at 17s. 6d. middle.

Brazilian Tractions are 5½ up at 137; the preferred, after touching 122, have reacted to 120½. Dollar stocks are somewhat irregular. Pennsylvania Water and Power capital stock at 188 is 4 up; Canadian General preferred is easier at 59½.

British Columbia Electric Railway stocks have given way, and, in the Home issues, British Electric Traction ordinary is 2 points down. These declines are due to the general condition of markets as a whole, and have little to do with the intrinsic values. The rubber share market is similarly affected. It is now a practical certainty that the exportable allowance of rubber allowed to companies that conform to the Stevenson Restriction scheme will be reduced to 60 per cent. on May 1st. Rubber shares remain in an uninteresting and somewhat neglected condition, the public taking no active interest at present.

Share List of Electrical Companies.

	Nom.	Dividend. 1925.	1926.	Price Apr. 4 1927.	Rise or fall.	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	£ 1	14	14	60/9	—	4 12 0
Brompton Ordinary	1	10	8¾	25/-	—	5 12 0
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. ½ Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	8¾	25/-	—	5 12 0
City of London	1	15	10	2 7/16	—	... ...
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	31/-	+1/-	5 3 3
County of London	1	15	7 7/16	28/-	—	5 0 0
do. do. 6% Pref. ...	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	26/3	—	6 2 0
do. 7% Pref.	1	6	7	23/-	—	6 1 9
Elec. Supply Corporation	1	10	10	30/6	—	6 11 2
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	26/-	+6d	5 15 5
London Electric	1	10	8½	24/6	—	5 14 3
do. do. 6% Pref.	5	6	6	5½	—	5 9 1
Metropolitan	1	11	8	28/6	+1/-	4 19 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	22/6	—	5 6 8
Newcastle-on-Tyne Ordinary ...	1	7	5	22/6	+6d	4 9 0
do. 5% Pref. ...	1	5	5	17/6	—	5 14 3
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	—	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	25/6	—	5 9 10
South Metropolitan Pref.	1	7	7	1½	—	6 3 0
Urban Ordinary	1	4	7	25/6	—	5 9 10
do. 6% Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	20 3	—	7 8 2
Yorkshire Elec.	1	8	8	29/6	—	5 8 4
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	3	62½	—½	4 16 0
do. District	,,	3½	3½	59	—	5 18 8
Underground Electric	£1	Nil	1½	16/6	—	1 16 4
do. do. Income ...	Bonds	6	6	102	+1	*5 17 8
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	100	—	6 0 0
do. Def.	,,	1½	1½	23¾	—	6 6 0
Automatic Telephone	1	3	10	50/-	—	4 0 0
Chili Telephone	5	5	6	6½	—¼	4 12 4
Cuba Sub. Ord.	10	5	5	7	—	7 2 10
Eastern Extension	10	10	10	17½	—	*5 14 3
Eastern Tel. Ord.	Stock	10	10	173½	—	*5 15 3
Globe Tel. and T. Ord.	10	10	10	18¼xd	—	*5 9 7
do. do. Pref.	10	6	6	10¾	—⅛	5 11 7
Great Northern Tel.	10	22	20	27	–	7 8 2
Indo-European	25	8½	10	46½	—	*5 7 6
Marconi	1	Nil	Nil	17 6	—	... ...
Marconi-Marine	1	10	7½	23/9	—	6 6 4
Oriental Telephone Ord.	1	12	12	52/-	—1/16	*4 12 4
United R. Plate Tel.	5	8	8	8 1/16	—	*4 12 1
Western Telegraph	10	10	10	16¾	+⅛	*5 18 8
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3¾	+1/16	8 2 6
do. do. 2nd Pref. ...	5	6	6	3 5/16	—	9 1 2
do. do. 5% Deb. ...	Stock	5	5	71½	—	7 0 0
British Electric Traction Ord. ...	,,	8	—	141½	—2	5 13 1
do. do. 6% Pref. ...	,,	6	6	109	—	5 10 1
Brazil Traction	100	5	6	137	+5½	4 7 3
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	89½	—	5 11 9
do. do. Preferred ...	,,	6¾	6¾	116½	—1	*5 7 6
do. do. Deferred ...	,,	8	—	156	—2	*5 2 9
do. do. Deb. ...	,,	4¼	4¼	79½	—	5 7 0
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	7/3	—	Nil
London United Tram. Deb. ...	Stock	4	4	51	—	7 16 10
Mexico Trams, 5% Bonds	—	5	5	21¼	—	6 18 0
Mexican Light Common	100	Nil	Nil	46	—	Nil
do. Pref.	100	Nil	Nil	99½	+2	Nil
do. 1st Bonds	—	5	5	71½	—	6 19 10
Yorkshire (West Riding)	1	5	—	8/9	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	13	13	52/6	—	*4 19 1
British Aluminium Ord.	1	12½	10	45/-	—	4 9 5
British Elec. Transformer Pref. ...	1	Nil	7	18/9	—	7 9 0
British Insulated Ord.	1	15	—	70/-	+1/16	4 5 9
Brush Ord.	1	10	—	28/3	—	7 1 7
Callenders	1	15	—	3½	—	4 5 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	85	—	5 17 8
Electric Construction	1	10	—	30/-	—	6 13 4
Enfield Cable Pref.	1	7½	7½	1½	—	6 6 4
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	8	—	12/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	7½	—	30/6	—	4 18 4
Henley	1	20	—	90/-	—	4 8 11
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	18/9	—	*5 6 8
Johnson & Phillips	1	17½	—	2 7/16	—3/16	7 2 9
Met.-Vickers Ord.	1	8	8	28/9	—	5 11 4
do. Pref.	2	8	8	2 7/16	—	6 11 5
Siemens Ord.	1	7½	—	26/9	—	5 12 2
Telegraph Construction	12	10	10	29xd	—	*4 2 9

* Dividends paid free of Income Tax.

Russian Electrical Notes.

(By Our Special Correspondent.)

Electrical Production.—At a recent conference of the representatives of the Leningrad works of the State Electrical Trust, it was stated that the production of all the works embodied in the Trust in 1925-26 amounted to a value of 78,548,000 roubles, an increase of 46 per cent. over the previous year. The share of the Leningrad works in the total was 45 per cent. Reductions in the cost of production were made last year to the extent of 40 per cent. in the case of lamps, 25 per cent. on apparatus, and 10 per cent. on machines.

According to the decision of the Industrial Planning Commission, the total value of production of electrical manufactures in the current year (1926-27) is estimated at 119,700,000 pre-war roubles. The output of the Heavy Electrical Engineering Trust will show an increase of 23 per cent. over the previous year, the Low-pressure Trust an advance of 55 per cent., the Accumulator Trust 20 per cent., and the Karbolite Trust 40 per cent. The demands of the market will be covered by home production to the extent of 80 per cent. The number of workmen employed in the industry will this year be increased by 9 per cent., and that of the staff by 38 per cent., while the efficiency of labour is expected to advance by 16 per cent. and the wages by 8.5 per cent. As to the capital expenditure on extensions this year, it is calculated that a total of 16,500,000 roubles will be required, of which about 44.5 per cent. will apply to the development of the construction of machines; some 51 per cent. of the total capital expenditure will be devoted to new construction and equipment. The scheme provides for the establishment of new transformer works, and works for the production of measuring apparatus and dry batteries. The Planning Commission considers it necessary for the sale prices of heavy products to be reduced by 12 per cent., those of the Low-pressure Trust by 10 per cent., and those of the Accumulator Trust by 12 per cent. It is calculated that the industry as a whole will yield a profit of 16,800,000 roubles this year, or over 11 per cent. on the turnover.

The "Elektrosil" Works.—At the end of 1923, when the question arose of allocating orders for the equipment of the hydro-electric works on the Volkhoff, which was recently brought into operation, the General Electrical Commission decided to place part of the contracts abroad and part with the Soviet works known as the Elektrosil. With great difficulty the latter succeeded in executing its allotted task in the form of two large generators, eight motor generators, and a number of transformers. Now that the contracts have been fulfilled the plant at the works is lying idle owing to the lack of further orders, the staff is being dismissed, and the experience gained is being lost. Under the circumstances it is suggested that fresh orders should be placed with the Elektrosil in connection with the projected construction in the near future of the Svir hydro-electric works, which is to afford a supply to the north-western industrial region.

The first turbo-generator (5,000 kW) has recently been completed at the works of the Elektrosil for the Ural platinum undertaking, the speed being 3,000 r.p.m. A 10,000-kW set is in progress for the Novorossisk works, and designs are being prepared for the construction of a 20,000-kW set.

The First Goods Locomotive.—The first electric locomotive built at Soviet works, constructed according to the system devised by Prof. Obraznova, has been placed in service between the Cherkizovo Okrujnoi station and the works of the former Provodnik, where the production of the State Electrical Trust is concentrated. The line passes a number of works and serves twelve undertakings.

Foreign Engineering Assistance.—In connection with the scheme for the utilisation of the falls of the Dnieper, and the proposed erection of a works of an ultimate capacity of 650,000 h.p., it is stated that the Russian Government has decided to secure the co-operation of foreign engineering firms. Besides the American firm of Cooper, with whom negotiations have already been conducted, it is said that the assistance of German works is to be obtained, as, for instance, the Siemens Bau-Union, which is to submit plans, descriptions, and offers concerning the method of construction and equipment.

The Electrical Bank.—The report for 1925-26 of the Electrical Bank states that the basis capital was increased by 71 per cent. and the turnover by 150 per cent. It is now proposed to raise the share capital by 20,000,000 roubles to 35,000,000 roubles, and to offer the new shares to all interested in electrification.

Hydro-Electric Development.—A representative of the Electric Planning Commission, referring to the projected large hydro-electric works on the Dnieper, is reported to have stated that in all probability it would be possible partly to utilise for this station the technical personnel employed on the Volkhoff constructional works. The Leningrad engineering works would also no doubt participate in the delivery of equipment for the Dnieper works as the former play a prominent part in the construction of hydraulic turbines, cables, &c.

Investigations have been concluded in connection with the construction of a hydro-electric works on the Volga, about two miles to the south of Ulyanovsk, with a capacity of 10,000 kW.

Preparations are now being made with a view to the construction of a hydro-electric works on the Svir, to have an ultimate capacity of 110,000 kW. The subject has attracted interest abroad, a Swedish turbine firm having sent in two schemes, one for three turbines of from 37,000 to 50,000 h.p. each, and one for four turbines. German firms have also asked for particulars of the contemplated works, while the British Vickers interests are said to be occupied in the preparation of estimates for high- and low-pressure equipment. Moreover, the Leningrad Metallurgical Works has presented a project for four turbines of 27,000 h.p.

The four Swedish turbo-generators are now at work at the Volkhoff hydro-electric works, which is largely assisting in affording a supply to Leningrad. The first Russian generator was started in February, and the three others will be put into operation shortly.

The Electric Planning Commission has decided that it is necessary to begin this year the construction of a hydro-electric works in Northern Georgia on the River Rione, near Kutaisa. The initial capacity is stated to be 21,000 kW in three units. The expenditure is estimated at 13,000,000 to 14,000,000 roubles. Hydro-electric works are also proposed in Carelia, Armenia, and on the Neva.

The Shteroff Station.—The first instalment of the Shteroff station, in the coal basin of the Donetz, has been completed, together with five sub-stations. One of the two 20,000-kW turbo-generators is now supplying energy to the neighbouring mines, while the other has been ordered in Germany for delivery this year. Three special furnaces have arrived from France for the consumption of pulverised coal.

A New Regional Station.—It is reported from Kharkoff that the Donetz Coal Trust and the General Electrical Commission have decided that it is necessary to construct a new regional station in the district of Stalin. Even if the extension works in connection with the existing station are fully completed the Stalin-Makevsk district, which is one of the largest in the coal basin of the Donetz, will experience a shortage of supply in 1929. The General Electrical Commission is now in search for a suitable site for the proposed new station. A second message from Kharkoff announces that the necessity has arisen for beginning this year the construction of a new station in the town of Zaporoje for the supply of the local industries and for assisting in connection with the construction of the projected Dnieper hydro-electric works.

Indian Electrical Notes.

(From Our Indian Correspondent.)

THE total provision made in the Indian Railway Budget for the year 1927-28 for the electrification of railways, is about 3¼ crores. The G.I.P. Railway alone accounts for nearly 2 crores of this amount. The projects include the electrification of the main line from Bombay to Igatpuri and Poona (costing altogether 5¼ crores), for which 1 crore is provided in the Budget, and the construction of a power house at Kalyan, near Bombay, costing altogether 97½ lakhs.

The rapid success of electrification is quite evident from statistics recently published. The section between Victoria Terminus and Kurla, a distance of 9½ miles, was electrified with effect from February 5th, 1925. By January, 1927, the train mileage of the section had increased sevenfold, and passenger traffic and earnings were twenty times as great as in the period prior to February, 1925. Similarly on the Mahim Chord of the Harbour Branch Railway, which was completed on February 3rd, 1926, a comparison between the statistics of January, 1926, and those of October, 1926, shows that the train mileage increased four times, that passenger traffic was doubled, and that earnings were trebled.

Mysore Electrical Extensions.

His Highness the Yuvaraj of Mysore recently opened the newly-constructed transformer and switching station at Kankanhally, which is meant to receive and transform not merely the power now transmitted from Sivasamudram but also that which may be developed later at Krishnarajasagar and Mekadatu. The present station is well equipped and designed with special care. The essential purpose for which it has been erected is to meet the increasing demands for power from the Kolar gold mining companies and for the lighting and running of industrial concerns in Bangalore and Channapatna.

New Undertaking in Jaipur State.

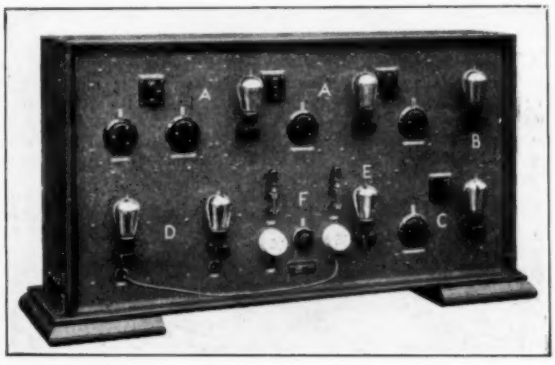
The Jaipur State in Rajputana in Central India has now been equipped with a modern electric generating plant. The capacity of the power station is at present 650 kW, made up of two sets of 250 kW each and one set of 150 kW, the engines being of Messrs. Vickers-Petters' latest design, direct coupled to alternators by the Metropolitan-Vickers Electric Co., Ltd.; the generating pressure is 3,300 V. The power house building is designed not only to house the present power plant but to provide for ample extensions. It is estimated that the cost of the public supply part of this scheme is over 11 lakhs of rupees, and, in addition to this, there is likely to be an expenditure of five lakhs in the substitution of electricity for gas street lighting, &c.

A "Press" Radio Receiver.

Marconi apparatus guaranteed for aural reception of news bulletins from any long-wave continuous-wave radio-telegraph station at the extreme limit of its range.

A RADIO-TELEGRAPH receiving outfit has been designed by Marconi's Wireless Telegraph Co., Ltd., to meet the growing demand for a dependable instrument wherewith to receive the official news bulletins which are transmitted daily by the Governments concerned from numerous high-power stations all over the world.

This "Press" type Rg.12 receiver is intended to operate over a wave range of from 10,000 to 25,000 metres, and is guaranteed to intercept messages from any long-wave c.w. station at the extreme limit of its range. A feature is that it is readily tunable to any particular station with the aid of the calibration chart and instructions supplied with each instrument; the calibrated handle of each tuning circuit



A, high-frequency filters.
B, rectifier.
C, local oscillator.
D, low-frequency filters.
E, note magnifier.
F, filament resistance, fuses and switches.

Fig. 1.—The Marconi "Press" Receiver.

enables the receiver to be instantly set at the required wave-length, so that the outfit can be used by any telegraph operator, although he may be quite unskilled in wireless reception. It is not a toy, but a high-grade commercial article made for the purpose of regular long-distance reception at predetermined times each and every day with reliability.

The criterion of good apparatus is not so much its ability to receive signals, as its ability to eliminate unwanted signals from other stations which may be operating simultaneously, and disturbance caused by atmospherics and local sources of electric radiation, which interference may be many hundreds of times stronger than the wanted signals. The selectivity of the new receiver is such that two transmitting stations of equal strength, lying in the same direction, can be separated if their frequencies differ by 120 cycles per second, which means that at 10,000 metres the receiver will select between two stations only 40 m. apart, whilst at 20,000 m. it will select between two stations only 160 m. apart.

The Rg.12 outfit (fig. 1), the dimensions of which are 3 ft. 3 in. by 1 ft. 10¾ in. by 13 in. deep, incorporates five DE.5 and two DE.5B valves, and selects directively by means of a 6-ft. rectangular wooden frame aerial, on the outside of which two multi-turn coils of insulated wire are wound: three fixed condensers and a variable one are mounted on the frame for aerial-tuning purposes, and each or all of the fixed condensers can be connected across the variable one by plugs and sockets. The vertical components of the frame, which tend to partially destroy its directional properties, are balanced to enable a pure figure-of-eight polar diagram to be obtained. If on the latter the circular polar diagram (obtainable with an ordinary open aerial, which receives with uniform sensitivity from all directions) is superimposed in correct phase (with the aid of the device shown in fig. 2) a "cardioid" diagram will be obtained (fig. 3): O is the centre of reception and X X the direction in which the frame lies; the lengths of the lines O E, O F, O G from O to the periphery of the heat-shaped figure indicate the relative sensitivity of the receiver in those particular directions when the figure-of-eight diagram is superimposed on the circle diagram. It will be noticed that in the direction O F the sensitivity is increased twofold and that the angle θ of approximate zero sensitivity is represented by A O B.

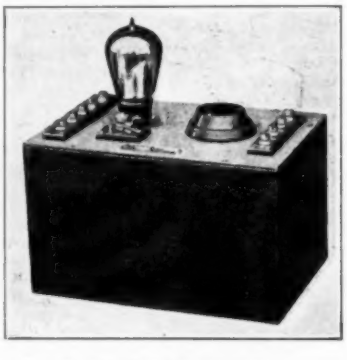


Fig. 2.—The Phasing Device.

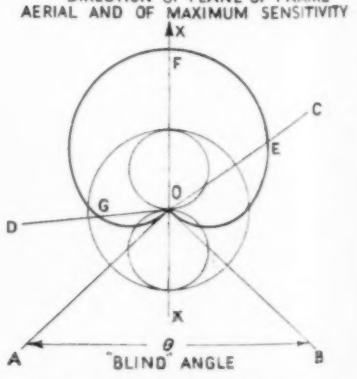


Fig. 3.—Heart-shaped Polar Diagram.

Which particular diagram is the most suitable depends upon the particular conditions prevailing at the moment of reception and can be chosen accordingly. The phasing device (fig. 2), which measures 10 in. by 6¾ in. by 7¼ in. high, consists of a single DE.5B valve, the grid of which is connected to a 35-ft. single-wire open aerial, whilst the anode circuit contains a rotatable coil inductively coupled to two fixed coils, which are connected to the frame aerial and to the receiver; a simple switch enables the valve to be switched on and off, thereby providing for heart-shaped or figure-of-eight reception respectively.

In addition, high-frequency selection is obtained by a system of three valve-coupled balanced tuning circuits of low damping; each contains a fixed inductance, three fixed condensers (any one of which can be included in the circuit by plug connectors), and a variable condenser. The first valve is coupled to the frame aerial by means of an adjustable coil; the third valve has a separate grid negative connection to enable it to be set at the rectifying point; and each circuit is enclosed in a separate screening box, the series collectively forming an efficient filter.

"Bottom bend" rectification is employed; it has an advantage over the "leaky grid" method inasmuch as it prevents strong atmospheric "paralysis" by enabling the circuits to return instantly to their normal condition. A local oscillator is embodied, consisting of a single valve with a tuning circuit comprising a fixed inductance, a fixed coupling coil, three fixed condensers with plug connectors, and a variable condenser; the circuit is enclosed in a screening box and works in conjunction with the rectifier, reducing the incoming signal to audio frequency before it is passed through two note filters designed for 1,200 cycles, which figure depends upon the difference between the frequency of the incoming signal and that generated by the local oscillator. Since a small change in the former produces a large percentage change in the latter, any incoming signal that differs slightly in wave-length from that to which the receiver is tuned will be eliminated by the note-frequency filters; the latter comprise two valve-coupled tuning circuits in separate screening boxes, one or both of which can be plugged into circuit. The single-stage note magnifier has transformer inter-valve coupling, its input being derived either from the rectifier or note filters, and it feeds low-resistance telephones through a step-down transformer.

The new receiver, other models of which are made for wave-ranges of from 4,000 to 10,000 metres and from 1,600 to 4,000 metres, is normally arranged for the aural reception of telegraphy, but can be adapted for operating a drum recorder by the addition of a Morse rectifier.

The receiver's total filament current is 1.75 A and that of the phasing device 0.25 A at 6 volts, the anodes being maintained at 120 volts with suitable grid bias. The component parts of the outfit are mounted on a vertical aluminium panel fixed to rigid framework which slides into a teak case, so that the whole can me withdrawn for inspection.

Electricity in Warships.

A survey of the applications of electricity on board British naval vessels.

By W. McCLELLAND, C.B., O.B.E., M.I.E.E.

(Abstract of Paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.)

PROBABLY the years 1904-6, with the adoption of 220 volts, the ring-main system, and parallel running of dynamos was the beginning of modern electrical development in the British Navy. Since then the applications of electricity have advanced in variety concurrently with those on shore, and the electrical installation of a warship to-day embraces most of the modern uses of electricity. Fig. 1 shows the growth of electrical developments in warships of the British Navy from 1887 to 1920.

The conditions obtaining in warships are so severe that special specifications are necessary, not only for completed apparatus, but for materials also. This does not mean that the Admiralty cuts itself adrift from the movement towards standardisation of specifications; in fact, the opposite is the case. The Admiralty is represented on many of the electrical committees entrusted with the preparation of the specifications of the British Engineering Standards Association, as well as on similar bodies, and British standard specifications generally are applied to the utmost limit possible.

Type of System.—When the whole installation is considered, there is little to choose between the a.c. and d.c. systems on the score of weight; bad commutation is now comparatively rare, and the use of direct current for ship work is supported, therefore, not merely by argument, but also by the consensus of naval opinion of the chief powers. The system of distribution must have its highest efficiency under action conditions. The ideal arrangement of a generator of appropriate size for each watertight compartment with suitable stand-by, so as to make each compartment self-contained, would be impracticable, on account of the number of generators required; the method adopted, however, should approximate to that condition. The d.c. two-wire system is adopted by nearly all navies, except the United States Navy, which uses a three-wire d.c. system at 120/240 volts, probably adopted when difficulties were experienced in manufacturing metal-filament incandescent lamps suitable for 230/240 volts and strong enough to withstand shock and vibration. A full consideration points to the superiority of the two-wire single-pressure d.c. system with both poles insulated; a great attraction of this system is its simplicity and reliability and the comparative ease with which defects can be made good in action.

Reliability, from the naval standpoint, means usually some method of interconnection of dynamos. In certain foreign navies, what might be termed a "multiple switchboard system" is used, each dynamo having its own switchboard from which the various supplies radiate. Separate busbars on each switchboard are arranged to be connected in series, so that by means of change-over switches each board may be fed either from its own dynamo or from the other dynamos in the ship. The chief argument against this system is that the average length of cable run per point must be greater than in the ring-main system; the total weight of cable used must be greater, and the additional amount of drilling of watertight bulkheads which such a system entails is a serious drawback.

The ring-main system was first introduced into the British Navy in 1904 by the late Mr. C. H. Wordingham, C.B.E., the author's predecessor at the Admiralty. It was a bold and progressive step and, although since that date many modifications and developments of the original system have been devised, in principle the system remains the same. Main switchboards are abolished as distributing centres, every supply being taken from the ring main by a path (mostly vertical) which avoids as much drilling of bulkheads as possible. Each dynamo is connected through a supply breaker and change-over switch directly to the ring main, and the whole supply system is controlled by electrically-operated apparatus from one central control room, although local control, as an alternative, is provided. With arrangements for isolating dynamos and sections of the ring main which may become damaged in action, the system offers maximum reliability.

Machinery.—Many diverse types of electrical machinery are used in modern warships. Generating units fitted in a modern capital ship may be taken to be as follows: from 4 to 6 steam-driven dynamos of from 200 to 300 kW each, and 1 or 2 Diesel-driven dynamos of about 200 kW each. About 400 electric motors are fitted, totalling approximately 2,300 b.h.p.; individually, the powers vary from 195 b.h.p., developed by some boat-hoist motors, to 0.3 b.h.p., the output of a small ventilating fan motor.

With so many motors to be maintained, the carrying of spares becomes an important consideration, and it was partly

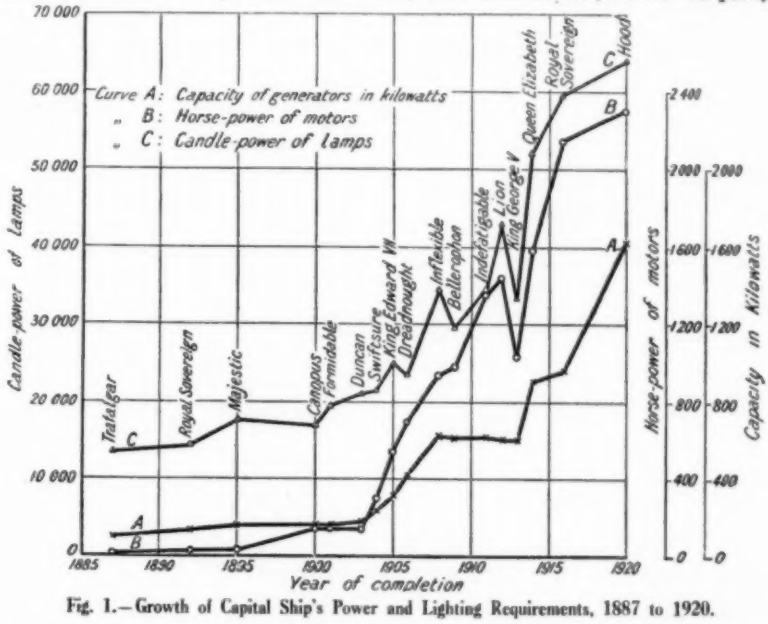


Fig. 1.—Growth of Capital Ship's Power and Lighting Requirements, 1887 to 1920.

for this reason that the British Admiralty designed ten sizes, the range of outputs being from 0.7 to 20 b.h.p. Aluminium alloys are used wherever they can be suitably employed, and special requirements are necessarily specified: bearings must permit the machine, when running, to be tilted from the horizontal through a specified angle which may be 15 deg. or 22½ deg.; special provision must be made for taking any thrust which might occur, and the larger motors are split horizontally, including the bearings when ring-lubricated. Nine standard sizes of brushes are specified, eight of which are the same as B.E.S.A. standards. The differences in the environment temperatures at various positions in the ship are considerable, and, for this reason, motors are divided into three classes, the object being to ensure that the maximum temperature of any particular motor shall not exceed an agreed figure. Totally-enclosed machines possess distinct advantages for warship purposes; various types of machines incorporating special cooling devices have been installed, and in some machines total enclosure may be used not as an end, but as a means, the transference of heat from the machine outboard being the primary consideration.

The methods adopted for motor control are similar to those in shore practice, but designs have usually to be modified very considerably for warship conditions. Electromagnetic devices are designed to hold on under shock and vibration even if the voltage is reduced by 20 per cent. Control gear must not contain inflammable material, and is arranged to break circuit on both poles. The majority of the motors are controlled by

startors, with or without shunt regulating resistances, or by controllers using series resistances or field grouping. A few automatic startors are used. For the larger motors, contactors operated by master controllers are employed. Many variable-speed motors are used in warships: the degree of control obtained with the electro-hydraulic system is very good, and an important application of this system is its use for the working of heavy gun turrets. Many of the lighter turrets have, however, been electrically operated, various methods of speed control having been used, some purely electrical and some electro-hydraulic. The latter is usually preferred by gunnery officers because of the precise control obtainable of the actual gun mechanism. In foreign navies, however, direct electric control for turret working is often employed. The Ward-Leonard system of control is applied to certain of the larger motors.

Lighting.—The head-room between decks is usually very restricted; machinery is mounted in all manner of positions, and structural obstructions are numerous. Consequently, except in a few spaces, it becomes necessary to employ a number of small and compact units, and often the positions available for the fittings do not coincide with the most desirable positions from the point of view of illumination alone. Resistance to shock is a very important problem where lamps and fittings are concerned, and manufacturers are required to supply a lamp of somewhat lower efficiency than is normal for shore use. The British Admiralty specification for lamps includes a shock test under which selected lamps, after being burnt for 50 hours, must withstand a certain number of blows. It is probable that the test will be increased in severity in view of the results of experimental work which has been proceeding, and, also, the lamps may be tested with the filaments burning, instead of cold as at present.

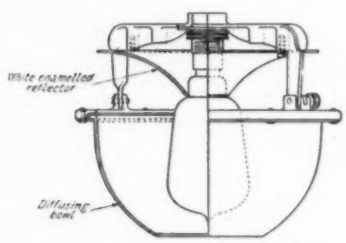


Fig. 2.—Semi-indirect Fitting for Officers' Cabins and Living Spaces.

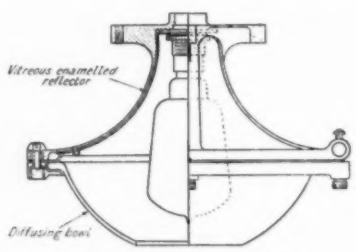


Fig. 3.—Mess Deck Pendant.

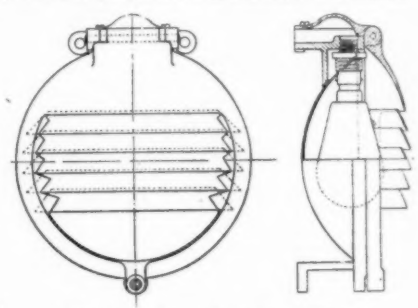


Fig. 4.—Police Light Bulkhead Fitting.

There is also the problem of screening the light source: so far as possible, fittings are designed to prevent the filament being visible at an elevation of less than 40 deg. to the horizontal, and the brightness of the luminous surfaces of the fittings within the range of vision is limited to 2.5 candles per square inch.

In order that there may be sufficient light to enable persons to move about the ship after "lights out," selected lights are fed from the "police light circuit," which is independent of the main switches in the distribution boxes. Screening may be accomplished by a suitable shade or diffusing glassware. A suitable non-brittle diffusing material of high transmission ratio which could replace glass would be of great utility for warship lighting fittings. Several typical fittings are shown in figs. 2, 3 and 4.

Magazine lighting fittings are designed to be watertight and very robust. The circuit of the lamp is automatically broken if the glass cover is accidentally smashed, or immediately the fitting is dismantled for the renewal of a lamp. A locking device makes it difficult for any unauthorised person to dismantle the fitting. The illumination of the hangars of aircraft carriers also requires special consideration, owing to the possible presence of heavy petrol vapour. For general lighting, high-candle-power gasfilled lamps are fixed overhead; there is, however, a considerable use of portable hand-lamps in these compartments, and in order to provide safety against possible explosion hand-lamps are supplied from a special 12-volt a.c. system at a frequency of 50 cycles per second. Petrol compartments and pump rooms themselves are lighted by means of external light boxes, gastight glass windows being fitted to the sides of the compartments.

In the design of fittings standardisation of parts is carried as far as the special conditions permit, so that the large variety of complete fittings may be made up from the minimum number of component parts.

Searchlights.—Such lamps are used extensively; in 1914, both automatic inclined and automatic horizontal lamps were in use, some of the projectors being arranged with electric motor-operated elevating and training gear. A short arc (⅛ in.) was used in all 80-volt ships, while in 100-volt ships the resistances were adjusted to burn the light with a longer arc (1 in. to 1¼ in.) in order to reduce the screening effect of the negative carbon. In larger warships having a 220-volt supply system, a motor-generator was fitted with each searchlight, the set being designed to give a constant current of 110 amperes over a pressure range of 58 to 62 volts; the motor-generators had automatic starters, and the arrangements permitted an arc to be started within 5 seconds from the moment of switching on.

During the late war, a British h.c.d. (high current density) lamp was developed at one of the Royal Dockyards. The luminous power of this lamp was 6 to 10 times that of previous lamps using the same current. The carbons were bathed in methylated spirit, as in the Beck lamp, the object being to prevent oxidation of the electrodes near the tips; a pump and vaporiser had therefore to be incorporated. At the present time, both l.c.d. (low current density) and h.c.d. lamps are in use in the British Navy; the latter differ in several particulars, such as:—(1) Forced cooling and ventilation are essential, owing to the intense heat generated, and the necessity for removing from the projector the products of combustion at the arc; (2) excessive oxidation of the electrode tips is prevented by various methods, such as the methylated spirit flame, or forced-air cooling of the electrode holder; (3) special arc-striking mechanisms are used; (4) the position of the negative electrode is automatically controlled to maintain constant arc length; (5) the positive electrode is rotated to maintain the symmetrical crater formation necessary for the maximum intrinsic brilliancy; (6) automatic focal control of the positive crater is provided by various means, such as thermostatic control, or a "third electrode."

The silvered glass parabolic reflector is almost universally employed for projectors, mounted on springs in order to withstand the effects of gun shock and to cope with the temperature differences obtaining over the surface of the glass, especially with the h.c.d. lamp. When a beam of high penetrating capacity is required, it is necessary to use carbons of small diameter working at high current densities; both carbons are cored, and certain metallic salts are embodied in the positive cores. Formerly, adjustable shutters, somewhat similar to venetian blinds, were fitted outside the front glass of the projector for purposes of signalling. In modern searchlights, shutters are necessary also for completely obscuring the light for indefinite periods. Shutters of the "Iris" type (as used in cameras) have now been adopted for normal use, the former type being retained for signalling purposes only. Ventilators are fitted in all projectors, but with the h.c.d. lamp a motor-driven exhaust fan is essential to free the barrel of fumes and to equalise the temperature over the mirror. In 220-volt ships a motor-generator has hitherto been used for reducing the voltage because of its economy in comparison with a series resistance, but experience indicates that the latter may probably give better all-round service. The methods of training and elevating the projector in action introduce many intricate and confidential electrical devices and circuits. *(To be concluded.)*

Discussion in London.

Dr. C. C. Garrard, who opened the discussion by expressing his appreciation of the author's sympathetic references to the work of the late Mr. C. H. Wordingham and of the B.E.S.A., wanted to know whether the metal-mica type of switchgear insulation had really justified itself; it might show mechanical weakness when subjected to vibration. With regard to the constant-current method of supplying winches, &c., when the motor was stalled the full current continued to pass through the commutator; would that not involve a risk of burning the commutator? He hoped that experience with *H.M.S. Adventure* would change the Admiralty's opinion of electric propulsion. He understood that at the end of each trip certain transatlantic liners' mechanical gearing was subjected to examination under a magnifying glass, a significant procedure which was indicative of the reliability that might be expected of such gear in war service. Electric ship propulsion might be considered in relation to railway electrification, which was undertaken for secondary reasons and not necessarily because it was more economical than steam traction. In the case of a merchant vessel, the increased cargo space made available thereby would be a governing factor, but in the case of a warship the greatest advantage was improved flexibility and quicker manœuvring ability; he believed that on the *Adventure* operations could be carried out more quickly than had been anticipated. Because the Admiralty staff had become accustomed to operating steam valves was not a reason why electrical controllers should be made to resemble steam valves. He urged the Admiralty to make the fullest possible use of automatic control from one position, which should not be the engine room. The weakest link in the chain was the human operator.

Mr. E. C. McKINNON was of the opinion that the problem of manufacturing a reliable submarine battery had been solved, if the conditions specified in the paper were taken as the criterion. The pasted-plate type had a life of at least four years, though operating conditions were very variable: some batteries might remain idle for long periods, while others might be required to undergo a large number of charge-discharge cycles. In the American Navy submarine batteries which had been installed in 1917 and 1918 were still in service, which was a reasonable life.

Mr. W. H. SCOTT pointed out that the British Navy had always been in the forefront, and had set a high standard of engineering practice, which had been of much benefit to land and marine practice in general. Methods introduced to the Navy by the late Mr. C. H. Wordingham had been adopted on land and in the merchant service.

Dr. P. J. G. JAKEMAN thought the paper would be of value to all manufacturers, for all could do their work better when they knew what was wanted. With electric propulsion it was possible to reverse the ship's propeller (not the ship) in from 15 to 20 seconds. He supported the plea for the adoption of more automatic control, for the man in charge should not have to depend on others who might not carry out orders properly, or quick enough. In the case of the a.c. system it was the stability of the whole (*i.e.*, generators plus motors) which must be considered, not that of individual parts; when Ward-Leonard control was employed provision must be made for the absorption of surplus energy at certain times, either by means of auxiliary plant or resistances: d.c. control was simpler, and the so-called difficulties introduced by the use of a large number of brushes no longer obtained.

Mr. RICKETS drew attention to the need for collaboration in research and experiment with large-scale tests, in order to avoid time-lag between theory and practical application; a few months' delay in application might have serious consequences.

Mr. A. REGNAULD thought the Admiralty was right in not worrying too much about the respective merits of the geared-turbine and turbo-electric drives, because they differed little in respect of efficiency, especially as the Navy had confined itself to the use of single-reduction gearing, and had not made the mistake of trying the double-reduction type. Now that the Admiralty was employing Diesel-electric propulsion it was on surer ground; the cruising range could thereby be increased at once by 100 per cent., or, alternatively, a corresponding reduction of fuel-carrying capacity could be made. He had recently been in New York, where Lloyd's chief surveyor had told him that such trouble as had been experienced had not been due to the electrical machinery, but to the Diesel engines; their speed was a little too high for their size and operating conditions. The difficulty had apparently been overcome, for the United Fruit Co. had placed a further order in this country for another ship, a fact upon which they could congratulate themselves; her electrical gear was to be made by the B.T.-H. Co., but the engines would differ from those installed in the company's earlier vessels. The late Lord Fisher, who introduced oil fuel to the Navy, probably visualised the ultimate introduction of the internal-combustion engine for propulsion. When the torque on the shaft of a Diesel engine was considered, it became evident that mechanical gearing would have to be ruled out, and the electrical transmission system became the only reasonable one.

Mr. C. E. VINES referred historically to the introduction of the electrical helm indicator.

Mr. H. ALLCOCK pointed out that the "bleeding" of cables in warm situations had also occurred in South African gold mines, but it could be overcome by impregnating the insulating paper before it was applied to the conductor. The author's twin flexible cable sheathed with tough rubber and reinforced with canvas might be improved by applying the canvas spirally, which would impart more flexibility to the cable. Resistance to crushing could also possibly be increased by placing a shaped cradle between the cores of the cable.

Mr. A. D. CONSTABLE explained that Navy specifications had been considered faddy and not commercial, but manufacturers were now beginning to appreciate the Admiralty's point of view. Since the late war most of its specifications had been revised. It was not realised outside the service what sort of conditions ships and their gear had to stand up to, and if Dr. Garrard interviewed the naval staff his enthusiasm for automatic control would wither; they preferred simple gear and relied on human operation.

Mr. E. T. WILLIAMS drew attention to the author's courage in breaking away from traditions of secrecy, and his attempt to present a perspective view of some of the problems encountered by the naval engineer. The author tried to co-operate with all concerned in order to obtain the best results; he had broad views about scientific advancement, but dared not make a mistake.

Mr. W. McCLELLAND, in reply, said, with regard to insulation, that, while makers would guarantee anything, the Admiralty was unable to get consistency from them. He would like to find a substitute for mica, and the American General Electric Co. and the British Thomson-Houston Co., Ltd., were developing a synthetic resin product with very promising results. Concerning the electric propulsion of ships, he thought it was a question of high policy whether the best cruising or maximum speed should be aimed at; personally, he was of the opinion that maximum speed was the desirable thing to achieve.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The "Mandem" Dial.

A new condenser dial, of the 4-in. diameter size, has been placed on the market by MESSRS. MCLEOD & MCLEOD. The M.55 knobbed pattern is illustrated in fig. 1; it is a high-grade component of good finish, made of moulded ebonite, engraved from 0 to 180 degrees, and provided with a grub screw for attachment to a ¼-in. spindle.

Fig. 1.—The "Mandem" Dial.

Hospital Equipment.

The equipment of hospitals with wireless receivers has brought into the sick wards a much appreciated means of entertainment and recreation. The GENERAL ELECTRIC CO., LTD., has supplied many hospitals and other institutions with wireless equipment, and the accompanying fig. 2 illustrates a set built for the Cambridge Hospital at Aldershot, to operate

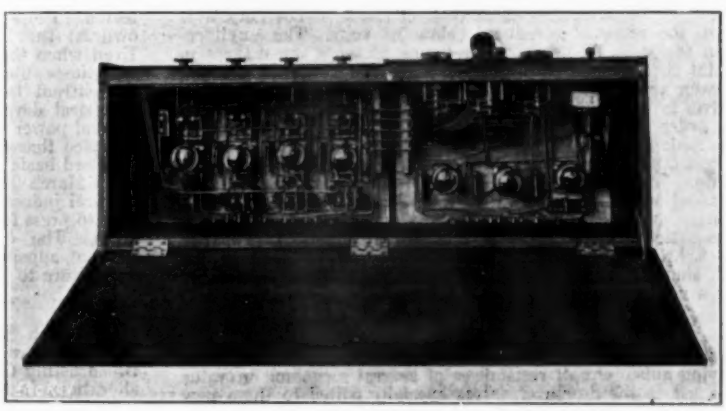


Fig. 2.—A G.E.C. Hospital Receiving Set.

approximately 400 headphones. The photograph shows clearly the neat design and compact lay-out of the receiver; in this particular case three tuned circuits were incorporated in order to cut out interference from a nearby telegraph station, which would not normally be necessary. The low-frequency amplifying portion consists of transformer-coupled stages, followed by a number of resistance-coupled single stages in parallel.

Filament Transformers for "K" Valves.

The General Electric Co., Ltd., is shortly putting on the market a transformer specially designed for use in connection with the "Osram" KL.1 valve, which has an indirectly-heated cathode. We understand that the transformer will be suitable for mains supply voltages of 200/250 at 50/100 cycles; the secondary winding will have a number of tappings by a combination of which the secondary voltage, for any number of valves up to four, will fall within such limits as will ensure that the valve is neither over-run nor under-run; this arrangement dispenses with the use of regulating resistances. The transformer will be enclosed in an iron case, the connections to the high- and low-voltage terminals being taken to terminals inside the casing.

The "R. C. Twosome" Amplifier.

It is refreshing to be reminded that crystal reception is undoubtedly advantageous in several respects. The reminder came in the form of a sample 2-valve amplifier designed by the Edison Swan Electric Co., Ltd., not to increase the range of the crystal receiving set with which it is incorporated, but to amplify the output sufficiently to enable a loud-speaker to be used. The circuit is exceedingly simple,

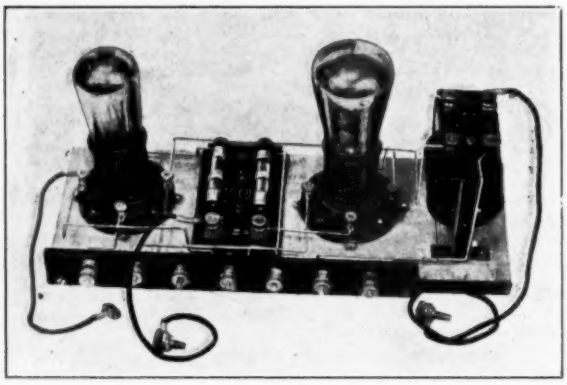


Fig. 3.—Ediswan Crystal Set Amplifier.

allowing of the set being home assembled at low cost. The crystal output is fed through a transformer, as indicated in fig. 3, to the grid and filament of an RC.2 valve, which is resistance-capacity coupled to a PV.2 power valve, both being of the 2-volt filament, 120-volt anode type, requiring 3 and 9 volts negative grid bias. The outfit is neat in appearance and workmanship, and occupies little space; the sample sent us was tried in conjunction with an "Ediswan" crystal set, and functioned quite satisfactorily.

A New B.T.-H. Valve.

The latest addition to the range of thermionic valves made by the British Thomson-Houston Co., Ltd., of which we have received samples is the B.8 type designed for resistance-capacity coupling. Its filament takes 0.12-amp. at 2.8 volts maximum, and marked diminution of results is not noticeable until the pressure is reduced below 1.8 volts. The amplification factor is 50, which large figure prompts the makers to claim that the amplification per stage can be made actually greater than that obtainable with transformer coupling. The valve is unsuitable for coupling direct to a loud-speaker: in order to utilise its great amplification factor fully, it is desirable to apply 120 volts to the anode circuit and to insert a resistance of from 2 to 5 megohms in series with the valve plate. Another feature is that if an ordinary transformer-coupled stage be replaced with a B.8 r.c. stage, the high-voltage anode consumption will be reduced to something like one-sixtieth. This valve is intended to function primarily as a l.f. amplifier or detector, but it can be used in the h.f. stage providing the set is adequately stabilised, preferably by a neutralising condenser.

New Mullard Valves.

The development of resistance-capacity coupled amplifiers having anode circuit resistances of several megohms in value has led to the design of valves specially suited to these new conditions. The impedance of the coupling being so high, the valve amplification factor can be made very high, the attendant increased valve impedance being of no consequence. The Mullard PM.1a and PM.3a valves have amplification factors of nearly 40; in consequence, if the anode circuit resistance be, say, 2 or 3 megohms, the amplification per stage should be equal to that obtained from a transformer-coupled amplifier. For reception of the local station, two PM.1a or two PM.3a valves may be followed by a 2-volt PM.2 or 4-volt PM.4. For stronger signals, the super-power PM.254 valve should be used in the last stage when using a 4-volt accumulator. Grid leaks should be fairly high, and sufficient negative grid bias should be used on the power amplifier.

The characteristics of the valves are as follows:—

	PM.1a.	PM.3a.
Max. filament voltage	2.0	4.0
Filament current (amp.)	0.1	0.1
Max. anode voltage	125	150
*Anode impedance (ohms)	72,000	63,000
*Amplification factor	36	35
*Mutual conductance (m/A per V)	0.5	0.55

*At anode volts=100; grid volts=zero.

It should be noted that the DP.425 and DP.625 power valves have been redesignated PM.254 and PM.256, respectively.

"Layerbilt" Batteries.

A new type of dry battery of American manufacture is now available for the heavy duty demanded by the anode circuit of neutrodyne and multi-valve radio receiving sets. Known as the "Columbia Layerbilt" No. 4486 pattern, its elements are made in the form of flat layers compressed against each other in order to actively employ all the cubic space and so reduce size. The 45-volt battery weighs 15 lb. 1 oz., and its dimensions are 8 3/16 in. in length, 7 7/16 in. in width, and 7 3/16 in. in height. It is a product of the National Carbon Co. (Inc.), U.S.A.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Easter Recess.

Replying to a recent question, the Prime Minister said that it was hoped that the House would adjourn for the Easter Recess on April 14th until April 26th.

Private Bill.

The Farnham Gas and Electricity Bill has been read a second time in the House of Lords.

Electricity and Agriculture.

On March 28th, during a debate on agriculture in the House of Commons, Sir Douglas Newton referred to the application of electricity to agriculture. He said that during the passage of the Electricity Bill through the House they were told that they would be able to get a cheap and plentiful supply of electricity, but a situation had arisen which was not very helpful and not very hopeful as far as a cheap and plentiful supply of electricity to agricultural areas was concerned. The fact that a large volume of electrical power was available on the farms enabled farmers in Germany and other countries to use larger and more efficient machines. It was a matter of some consequence to farmers and agriculturists that electricity should be made available to them, and steps must be taken to provide greater facilities for the erection of overhead lines. Arrangements should be made for the official recognition of standard rates of payment in connection with the provision of wayleaves for overhead lines and similar arrangements for obtaining consents in a simplified and cheaper way. At present the cost of an overhead line was increased by £100, or even £200, for the expense of obtaining consents and wayleaves. Those difficulties were not in all cases due to landowners; the Postmaster-General himself was an offender. Even when the Postmaster-General was not a first comer, he sometimes subsequently called on the undertaker who brought the current to provide protection for the Post Office wires. Electrical development would continue to be retarded until general power was given to undertakers to use overhead lines, provided that they erected them in compliance with a certain standard basic specification.

On March 30th, during a debate on the need for a revival of rural industries, Mr. Fenly urged the Minister of Agriculture to press for the application of the Electricity Act to rural areas. The Government stood self-condemned because it had not appointed one single person specifically interested in agriculture to the Electricity Board.

Broadcasting.

On March 29th, Sir W. Mitchell-Thomson informed Mr. Everard that no application had been received from the British Broadcasting Corporation for permission to make any further alterations in the wave-lengths employed by its stations.

Mr. Day inquired when the regional scheme for broadcasting on higher wave-lengths would be completed, so that listeners would be able to obtain alternative programmes from the Daventry broadcasting station.

Sir W. Mitchell-Thomson said that the British Broadcasting Corporation proposed to carry out experiments at Daventry at an early date, and when those had been completed they

might be in a position to submit proposals for the establishment of regional high-power stations.

Lieutenant-Commander KENWORTHY asked why it was that the British Broadcasting Corporation was to receive £50,000 in revenue less this year than last year; and how many licences were in force this year as compared with last year.

Sir W. MITCHELL-THOMSON said that the amount paid to the British Broadcasting Company last year covered not only the revenue for the service, but also the sum required for the repayment of the company's share capital and the expense of winding up the company. The revenue of the British Broadcasting Corporation during the financial year 1927-28 would be substantially greater than the revenue of the company for the conduct of the service during the year 1926. The number of licences in force on February 28th, 1926, was about 1,906,000 and the number in force on February 28th, 1927, was about 2,235,000, in addition to about 4,400 free licences for blind persons.

Special Orders.

Special Orders have been approved in respect of the urban district of Rothbury and parts of the rural districts of Alnwick and Rothbury, Northumberland; the urban district of East Dereham, Norfolk; the urban district of Seaham Harbour and the parish of Seaham, Durham; the borough of Rye, the urban district of Battle, the rural districts of Hastings, Rye, and Battle, and the parish of Ninfield, in the rural district of Hailsham, East Sussex.

Rural Telephone Developments.

On March 31st Sir W. MITCHELL-THOMSON, replying to criticisms of the telephone service, said that in 1913 the rural telephone exchanges numbered 1,254. They were now nearly 2,700, and of those 1,000 had been provided at unremunerative rates. The number of those exchanges was growing at the rate of from 13 to 14 a month, and each started with an average of 12 subscribers. The number of subscribers tended to grow, and in 1925 the average number per exchange opened rose from 14.8 to 16, and in 1926 it rose to 17.3. The average initial loss on each of those exchanges was about £50 per annum. He agreed that the Post Office ought to carry an unremunerative fringe in order to provide for the expansion of the telephone service, but if the interests of the majority of telephone users were not to be prejudiced by having their rates kept at an unnecessarily high level the expenditure on the unremunerative fringe must be kept under some sort of control. Out of about 950,000 subscribers throughout the country, 88,000 were connected with rural exchanges, a proportion of 9.3 per cent. The population outside the urban districts was, however, only 20 per cent. of the whole. The Post Office was doing its best to meet the desire of farmers to have means of communication with railway stations. Nearly 100 railway stations were now provided with telephones, and about 40 more were under consideration. If the telephone service were conducted by private enterprise there would have to be either a close working agreement providing for the closest possible intercommunication between two competing systems, and a standardisation of plant and general working conditions, in which case competition would be eliminated altogether; or else a consistent and vigorous competition between the two systems, refusing all intercommunication, resulting in a restricted service, and sooner or later the disappearance of one of the systems, leaving behind a wasted or wasteful plant.

The E.D.A.-E.L.M.A. Campaign.

Discussion at Newcastle.

THE last E.D.A. Conference at Newcastle, on March 9th, discussed the E.D.A.-E.L.M.A. campaign. Mr. A. Albrecht, who presided, said that much good had been done and nuclei now existed all over the country for the furtherance of the work. Mr. Wilson (Johnson & Phillips) said that the demand had been increased by the campaign, supported by the assisted wiring schemes of the municipal authorities. There was a need for a standardised wiring system. He also thought that there was a need for "tighter" registration to secure good workmanship. Mr. Edgar (South Shields), while admitting that the campaign had done enormous educational work, considered that it had lasted too long; a shorter, more intensive, campaign would have been better. Moreover, the districts should have been consulted before the campaign was launched. He looked forward to further, improved, campaigns in the future. Mr. S. G. Pike (Newcastle Electric Supply Co.) agreed with Mr. Edgar that the Press publicity could have been improved upon if local people had been consulted first. He produced a communication which a gas company had issued to its employés asking them to do their utmost to counter the effects of the campaign. Mr. Pike suggested that the company should be asked for its views on the success of the campaign. Mr. E. L. Beck said that great courage had been shown in running a scheme of American origin in this country, and it had been done successfully. Mr. R. Kirkland thought that the campaign to a certain extent overlapped the good work which was already being done by the Newcastle Supply Co. He also agreed that the period was too long to sustain public interest. Mr. G. W. Umpleby (Newcastle Co.) gave his unqualified approval to the campaign and thought that it could be extended with advantage; he hoped that another one would be held soon. Mr. J. Coney (Siemens & English Electric Lamp Co., Ltd.) said that the campaign had undoubtedly sent up the sales of lamps and appliances. Mr. W. Horsfall (General Electric Co., Ltd.) considered that the campaign had helped the industry to withstand the strain of the past year. Mr. Adam also gave his approval to the scheme. Mr. J. H. Parker (West Hartlepool) said that valuable work had been done in getting the contractors together, and the exhibition houses had proved remarkably successful. Mr. McKenzie thought that greater success would be achieved if assisted wiring schemes were extended beyond lighting and if appliances were standardised. Mr. Evans stated that he thought the discussion was premature, for the results of the campaign were not yet known. While perhaps the period was too long for the North-East Coast, that was not true with regard to many other areas which were not so advanced. While Mr. Alderson was grateful for what had been done, he, too, thought that the campaign had lasted too long. Mr. Hibbert Smith said that the period was too long from the public point of view only; such a campaign should last six months, but the first half or more should be devoted to organising the circles, &c. Mr. Pinkney said that consideration was being given to a campaign next season, and he thought that next time the local centres would be consulted first. Mr. Heslop did not doubt that good would come from the campaign. The chairman, in concluding the discussion, said that the points mentioned would be brought to Mr. Beauchamp's attention.

The Metro-Vick Carnival.

THE annual Metro-Vick carnival was held in Manchester on April 1st. A large number of people in a brilliant variety of costumes spent a happy evening. Our illustration shows an 18th-century group who gracefully danced a minuet.

Over a thousand took part in the grand parade, and the task of the judges was a difficult one. After a careful process of elimination, prizes, distributed by Mrs. Hilton, wife of the vice-chairman, were awarded as follows:—Ladies: Prettiest costume, 1st, Miss Darwin (maintenance department), "Russian Dancer"; 2nd, Mrs. Crawford (Glasgow office), a

18th Century Costumes at the Metro-Vick Carnival.

"Fan"; 3rd, Miss Dora Bentley (M.V. Supplies, Manchester), "Dolly Sisters"; visitors' prize, Miss Hamp, "Bouquet of Roses"; most original costume, 1st, Miss Cooniham (G. Coil winding), "Sarah Gamp"; 2nd, Miss M. Brierley, "Squibs." Gentlemen: Most effective costume, 1st, G. Burness (switchgear drawing office), "Fortune Teller"; 2nd, J. Lyst (K. switchboard), "Mark of Efficiency"; 3rd, J. Brierley (K. machine), "Phantom of Opera"; visitors' prize, G. Bircumshaw, 1st, "Persian Market"; 2nd, C. Sanders, Tom Webster's "George"; most original costume, 1st, C. Booth (instrument department), "Clown"; 2nd, C. Glover (D. machine), "Buffalo Bill." The scheme of decoration was a great triumph for the Metrovick engineers. Festoons of coloured lamps arranged along the balustrade of the gallery, practically encircled the hall, and were interspersed with a dozen powerful "spot" lights of various shades, giving a charming effect. In addition, no fewer than 3,000 balloons were used and by an ingenious contrivance they were released simultaneously while the dancing was in progress. Another novel feature was an arrangement in the shape of a silver coloured champagne glass hanging from the centre of the dome. At a given signal this slowly overturned and discharged close on 2,000 inflated balloons. There were also a number of other "stunts."

The National Physical Laboratory.

A Review of the Annual Report for 1926.

THE annual report of the Executive Committee of the N.P.L. on the work in hand and that accomplished during 1926 indicates that the steady progress which has marked the work of the Laboratory during the past few years was well maintained during the year under review. Notwithstanding the adverse industrial conditions which prevailed there was no material diminution in the amount of work the Laboratory was called upon to perform for firms and outside bodies; the demands made on it by the Research Boards and Committees of the Department of Scientific and Industrial Research increased, while the additional provision recently made for the more fundamental work of the Laboratory enabled satisfactory advance to be made with many problems requiring investigation. In general, the advance in the application of science to industry has created a demand for accurate measurement in a multiplicity of directions, and at the present time the resources available are barely adequate to enable the Laboratory to maintain the required lead.

A recent example of development is furnished by the application of X-rays in industry: an institute for the examination of materials by means of X-rays has been established in Berlin, and on the recommendation of the Laboratory Research Committee, approval has been given by the D.S.I.R. to the formation of a section at the Laboratory for this purpose. The work will be under the general supervision of a Committee of the D.S.I.R., with Sir William Bragg as chairman. The measurement of ultra-violet light has recently become of great importance for medical and other purposes, and experiments are in progress with a view to establishing standard methods of measuring the intensity of ultra-violet radiation.

The employment of very high voltages in the distribution of power has introduced a number of new problems in the measurement of electrical quantities, and of new requirements in respect of the knowledge and use of insulating materials. The extension of the Laboratory's activities in this direction was approved, with the support of the Electricity Commissioners, in 1923; the building for the work is complete and the equipment, to give one million volts, with an available supply of 500 h.p., will shortly be installed. The Executive Committee has appointed a special Committee to advise as to the programme of work to be undertaken in this new high-voltage laboratory. The work of the Physics Department has been greatly hampered by the inadequate accommodation, and the urgent need of a new building has been pressed repeatedly by the Committee during the past seven or eight years; it is hoped that the erection of the central block of this building will not be long delayed.

The Laboratory has important duties to perform in connection with international standardisation generally. The Commission Internationale des Poids et Mesures will hold its next meeting in Paris in September, 1927, and discussions will take place on the establishment of a suitable international thermometric scale extending to temperatures of 2,000 deg. C. and upwards. The International Illumination Commission is to hold its next meeting in America in 1928, when the difficult questions of heterochromatic photometry and the establishment of suitable standards of candle power for measurements of modern high-efficiency electric lamps will be further considered. It is proposed that meetings of the Executive Committee should be held in Italy in September, 1927, when a full meeting of the International Electrotechnical Commission is to take place. The Union Radio Scientifique Internationale will meet at Washington in 1927. A considerable programme of work is in progress at the Laboratory in connection with these international conferences; intercomparisons of the standards of resistance, voltage, candle power, and radio-frequency with those of other national laboratories are also proceeding.

Comparison shows that the total number of tests undertaken in all departments during 1926 was 609,323, being a decrease of 44,989 on the 1925 figures; in the Radiology Division the number of tests declined by 167 to a total of 134, while in the Electricity Department the number decreased by 1,175 to 2,499.

General Research.

In the Physics Department research into the heats of combustion of gases has been added to the programme during the current year, and further work has been done in the designing of simplified forms of steel mercury-vapour pumps for medium and high backing pressures. Notable progress has been made with "sound" research; the main questions dealt with have been the provision of suitable sources for the production of sounds for experimental work; methods of measuring intensity; measurement of the reflecting, absorbing and transmitting properties of materials; and examination into the acoustics of buildings is now amongst the test-work undertaken in the Sound Division.

In the Radiology Division a new form of Shearer tube has been designed and work has been continued on the determination of the optical axes of single crystals. Study of the X-ray spectral lines in copper in different chemical combinations has been commenced, and research is in progress into the variation with wave-length of the absorption coefficient of homogeneous rays, more particularly on either side of the K discontinuity of the elements of low atomic number.

Good progress has been made in the Optics Division with the development of photo-electric methods of spectrophotometry, which it is proposed to employ for the measurement of ultra-violet light; difficulty has been found in obtaining a steady source of ultra-violet radiation for experimental work, and special methods of photometry adapted for use with fluctuating sources have had to be devised.

In the Electrical Standards Division of the Electricity Department, a modified form of Kelvin double bridge for alternating-current measurements has been devised, and measurements of the impedance of thermionic valves have been made, in connection with the research into methods of measurement of amplification. An investigation is in progress into methods of precision measurement of the properties of liquid dielectrics. The horizontal force magnetometer for Abinger, Surrey, completed last year, has been erected there, and comparison with the Laboratory instrument showed very close agreement. Good progress has been made with the construction of the vertical force magnetometer; a null method is used, and a novel and ingenious device is employed for the detection of any residual magnetic field, which enables an accuracy within about 2γ to be obtained in the measurements. The investigation into the magnetic properties of alloys is being continued, in collaboration with the Metallurgy Department.

The Electrotechnics Division has been largely occupied with the study of suitable methods of measurement for use at very high voltages. The results of tests on resistance materials, extending over a considerable period, have been collected for publication, as have also those on methods of earthing electrical circuits. The study of photo-electric methods of photometry in the Photometry Division has yielded important results.

Special Investigations.

This heading comprises the work of various kinds, other than that for Government Departments, for which payment is received. It includes tests in the Radiology Division on materials of low radioactivity, such as waters and pastilles used in emanators. The work of the Standards Division of the Electricity Department has, as usual, included tests of standard coils and cells, condensers and inductances, wavemeters, &c., and magnetic tests of various materials. Assistance has been given to firms in the construction of apparatus for the total loss testing of magnetic material, and for other purposes. In the Electrotechnics Division some important researches have been undertaken for the British Electrical and Allied Industries Research Association. An investigation is being made into the different methods of measuring the power lost in the insulating material of cables for the transmission of electricity. A beginning has also been made with an investigation into the physical properties of high-voltage power transmission cables, as affected by the conditions of loading and laying. A report on the resistivity of porcelain is being revised for publication. There has been a steady flow of alternating-current test work, and a number of approval tests of meters for the Electricity Commissioners are in hand. At the request of the Commissioners the Laboratory is considering the verification of watt-hour meters designed to record a standing charge in addition to the power consumed. Standard resistances have been designed and constructed for the testing of heavy current meters as employed in connection with electrochemical processes. Test-work in the Photometry Division has included the calibration of portable photometers, measurements of the light distribution of various lighting units and tests of thermionic valves.

Sir J. E. Petavel, director, records that a number of changes in the senior staff took place during the year. Mr. Murdock retired in May, on reaching the age limit. Dr. Owen, who was in charge, under Dr. Kaye, of the Radiology Division of the Physics Department, was appointed Professor of Physics in University College, Bangor; Dr. Hanson was appointed to the Feeney Professorship of Metallurgy at Birmingham University, and a number of promotions and new appointments have been made.

A Large Electric-Sign Controller.

A machine for operating an "electric-newspaper" sign in Siam, which is believed to embody the fastest "make-and-break" contact apparatus ever devised.

A LARGE electric-sign controller which has recently been made in this country and is about to be shipped to Siam is of unusual interest in that it is claimed to embody the fastest "make and break" ever devised. It is to operate a sign of the "electric-newspaper" type consisting of a rectangular bank of lamps upon which is produced the effect of a constant stream of travelling words, and which will be used for giving news and for advertising purposes, in both English and Siamese.

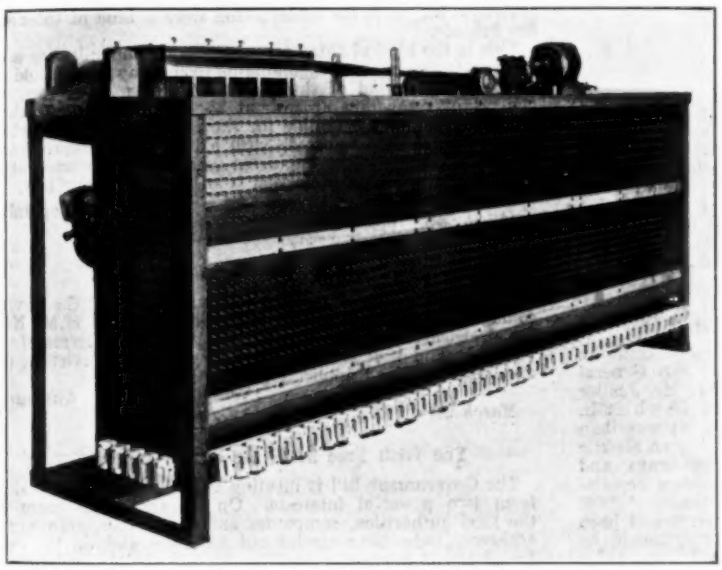


Fig. 1.—Electric-Sign Controller (Exterior).

The operating principle employed is that in which a perforated paper is passed between two identical sections of spring-operated contacts, actual connection being made at the points of, and hence in the same formation as, the perforation.

The apparatus is built up in a framework of angle-iron measuring 7 ft. 9 in. long by 2 ft. wide and 3 ft. 6 in. deep. Fig. 1 shows an external view of the controller. The panelled sides are of bakelite, and accommodate 2,340 bolt-and-nut contacts, each acting as the return or control connection for one lamp in the actual sign. The contacts are arranged in the same formation as the lamps in the sign, *i.e.*, in a rectangular block with 130 vertical and 18 horizontal rows, any one contact being connected to the corresponding lamp in the sign. Each pair of vertical rows is protected by one of the s.p. fuses shown at the base of the equipment. Leads from the contacts on the internal side of the panels, fig. 2, are taken to the lower portion of a master contactor unit mounted horizontally on the top of the controller, fig. 2 right, fixed contacts being employed for the actual connections. In conjunction with these fixed contacts there are spring-controlled ones which, with similar and corresponding devices in the top part of the unit, act as the master control of the apparatus. The contacts in the lower section of the unit are separately insulated, being built up in an ebonite slab, while those in the top portion are housed in a brass block which itself forms a common return to the whole circuit.

The perforated paper is drawn between the two sections of the control unit by means of a small rolling machine constructed on the lines of an ordinary domestic wringer. This is chain driven through a worm gearing by a small electric motor. Between the roller and the control unit the travelling paper is taut and lifts a metal rod, the ends of which run in slots in two vertical guides. In the event of the paper breaking, the rod drops and lifts a small mercury cut-out, which in turn opens a relay governing the main contactor switch. This switch, with a pair of main fuses, controls the whole apparatus and is installed at one end of the framework. Two local circuits serve the paper-driving motor and the release cut-out and relay. The equipment is designed for a maximum loading of 200 A, and will operate on 120 V, a.c., 50 cycles.

It is estimated that in normal working the contactor unit performs some two million make-and-break operations per minute, while it is claimed that the apparatus is capable of a sustained operation of ten million contacts in a similar period. Each contact point on the master unit occupies a space of about 1/50 sq. in., and the corresponding area in the sign is about 36 sq. in.

The controller is wired, internally, with single 22 C.G.S. wire threaded in sleeve insulating tubing, about 5,000 yd. of each material being used.

It is, of course, necessary, where a continual change of wording on the sign is required, to have a ready means of perforating the paper, and a suitable machine for this purpose is being dispatched with the controller. Ordinary good-quality brown paper is used. The sign will be equipped with 20-W m.f. lamps, and 350 English letters per minute will traverse it in normal operation.

The complete controller has been manufactured by the Sign Construction Co., Ltd.

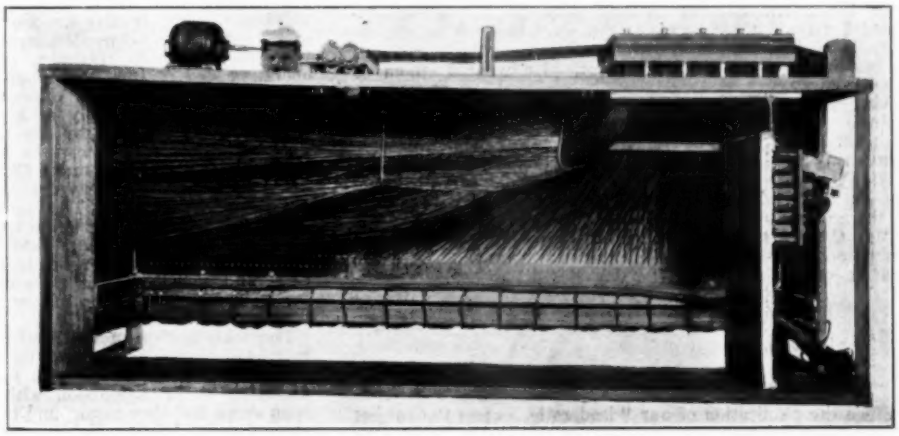


Fig. 2.—Back of Controller, showing Internal Wiring.

The Batti-Wallahs' Society.

At the annual general meeting of this Society on Tuesday, March 29th, the following officers for 1927 were elected:—President, Mr. G. W. Partridge, M.Inst.C.E.; vice-president, Mr. Walter Riggs; hon. secretary, Mr. M. Whitgift; committee: Messrs. A. E. Apps, H. Howard, H. S. Jacob, H. Tomlinson Lee, H. S. May, and G. S. Peckham.

Legal.

Imprisonment for Faraday House Secretary.

The Times reports that on March 30th, Henry William Fairman, 47, of Dulwich, was charged, on remand, at Bow Street Police Court, before Mr. Fry, with stealing £52 10s. belonging to his employers, the Electrical Standardising, Testing, and Training Institution, Ltd. (Faraday House), Southampton Row, W.C. Mr. E. B. Knight, prosecuting, said that the defendant had been in the employment of the company for 27 years, and had latterly held the position of secretary at a salary of from £550 to £600 a year. For three or four years past he had made a practice of misappropriating fees paid by students, the total sum involved being £4,500. After discovery had been made Fairman offered to make full restitution, and had already placed £4,500 in the hands of his solicitors for this purpose. He attributed his trouble to living on a higher plane than his salary warranted. Mr. Walter Frampton, for the defence, said that the whole of the money had not been accumulated, but full restitution was possible by means of wise investments. The magistrate passed a sentence of three months' imprisonment in the second division.

False Pretences Charge.

At Bolton, on April 1st, Duncan McQueen, traveller, pleaded guilty to obtaining various sums of money by false pretences. Norman Richardson, radio engineer, Burns Street, said that he advertised for a traveller, and prisoner responded. He was engaged, and he was to receive one-third of the value of the orders he obtained. Mr. Richardson found that all his orders were false, none of the persons named having given prisoner any order. The Bench imposed a fine of £10 and accepted prisoner's offer to pay at 10s. per week.

General Engineering Development Trust, Ltd.

The petition of Walter Hill & Co., Ltd., judgment creditors for an order for the compulsory liquidation of the General Engineering Development Trust, Ltd., was before Mr. Justice Romer in the Companies' Winding-up Court on March 29th, the petition having been presented in January. It was then stated that the respondent company was exploiting an electric route indicator which was applicable to tramways and 'bus services. The petition was adjourned to facilitate negotiations for raising new capital and settling the petitioners' debt. Mr. Wallington informed his Lordship that terms had been signed, and it had been agreed that the petition should be dismissed without costs. His Lordship made an order accordingly.

Electric Light Plant Dispute.

In the Chancery Division on March 31st, Mr. Justice Tomlin heard a motion by Mr. R. W. Pudsey-Dawson, of the Barn Engineering Works, Effingham, Surrey, asking for an injunction against the Effingham Estates, Ltd.

Mr. Grant, K.C., for the plaintiff, said he desired an injunction to prevent the defendants from entering certain premises which, the plaintiff said, the defendants had demised to him, and making use of the electric light plant that was there. The plaintiff negotiated for the purchase of the plant from the defendants, but nothing came of it. When the plaintiff refused them access to the plant the defendants, he alleged, made a hole in the wall and had regularly gone on to his premises and used the plant. He wanted them to take it away.

Mr. Preston, K.C., for the defendants, said there was a definite agreement to buy the plant, which, he said, the plaintiff had wrongfully repudiated. The defendants were entitled to have access to the plant and to work it.

His Lordship said that if the parties would agree to some form of undertaking in the meantime he would fix the trial of the action for the first day next sittings.

Mr. Grant, after consulting Mr. Preston, said they had agreed on an undertaking. His Lordship thereupon fixed the hearing of the action on the day stated.

The Truth About Electric Ovens.

Since the publication of our "leaderette" upon the subject of the alleged generation of ozone in electric baking ovens (March 11th), the Metropolitan-Vickers Electrical Co., Ltd., has sent us copies of two letters which it has received bearing on the matter. The first is from the chief electrical engineer of Zurich, who says that any disagreeable smell which may arise in an electric oven is due to failure to clean the appliance. The other, from M. F. Graf, consulting engineer, Baden, says that the production of ozone in electric ovens is impossible. In some of the early types the disintegration of the material in which the elements were embedded caused pastry to acquire a disagreeable taste, but this defect cannot occur in the modern types of oven.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

The Salaries of Engineers.

Whilst agreeing with your correspondent "P.W." that the placing of electrical undertakings in the control of gas managers is not to the complete benefit of the electrical industry, it is no doubt a course dictated by the desire for so-called economy. The question, however, is whether this so-called economy in management costs is not of the most expensive kind, not only to the undertaking itself, but to the electrical industry generally.

I heard some time ago of a case where a bulk supply undertaking of not the smallest dimensions was handed over to the care of the local sanitary inspector and surveyor. Not long ago I heard of a town of over 4,000 population, about to take bulk supply, where, on completion of the scheme, it is to be handed over to the supreme care of a local tradesman as a part-time job, as if the undertaking were a kind of voluntary fire brigade.

This is the kind of thing for which some public bodies want severely trouncing, and then guiding in the way they should go.

But for this kind of thing (not forgetting, of course, the general overcrowding at present so evident), perhaps there would be less of a scramble for the £2-a-week jobs to which your correspondent referred—with a consequent improvement in the salaries of those engineers whose qualifications entitle them to a reasonable protection from the labour profiteer.

Hopeful.

March 26th, 1927.

Electrical Engineers in the Navy.

Perhaps you or some of the numerous readers of the Review could advise me as to the conditions obtaining in H.M. Navy for electrical engineers, *i.e.*, general conditions, terms of service, &c., and if it is really worth trying for experience; and also where to send application for joining.

Anxious.

March 28th, 1927.

The Irish Free State Electricity Supply Bill.

The Government Bill is meeting with determined opposition from two powerful interests. On the one hand there are the local authorities, companies and individuals, statutory or otherwise, who have carried out schemes, and on the other the electrical contractors acting through their Association.

The management and organisation of the Shannon works follow naturally on the Act of 1925, but as the present Bill now stands the Government claims arbitrary powers over all existing undertakings, even to the point of confiscation.

At the inception of the scheme it was understood that electricity was to be supplied in bulk to all existing undertakers at a cheaper rate than they could produce it by themselves, and that the body to be put in control was not to engage in distribution except in such areas as had not already made provision for supply. With reference to the existing undertakings it was clearly stated by the Government's experts in their report: "It should be remarked that the State supply and the development of the Shannon scheme will by no means involve the dismantling of the organisations existing in these towns (the larger and medium-sized towns) with the exception, perhaps, of a small portion of the operating staff." It is now sought to obtain powers enabling the Electricity Board to offer an authorised or statutory undertaker a bulk supply at a rate equal to, or less than, the cost of generation by the undertaker, and if he does not want to take it he can be made to do so. The whole thing is cleverly shaped under Clause 20, which provides that up to 1932 the Board may charge an uneconomic or nominal price for bulk supply. This means the end of all existing undertakings, private or municipal. When they are wiped out the Government comes into its own, for after 1932 the Shannon scheme must be firmly established as a paying concern, and such prices or rates as have hitherto been made for bulk supply must be increased to make it so. It is all very simple.

The Irish Section of the Electrical Contractors' Association may be depended upon to put up a good fight against Clauses 47 and 48. These clauses give the Electricity Board powers, separately or in conjunction with authorised undertakers, to open shops and showrooms, and to sell fittings, apparatus, and appliances for heating, lighting, power, and all other purposes for which electricity could, or might, be used, and also to undertake the wiring of private houses. This may, or may not, mollify to some extent the confiscated undertakers at the expense of the contractors, but it can scarcely be expected that the contractors are prepared to go out of existence in order to make things easy for the Government. They do, however, appreciate the joke as quite racy of the soil, but unlike the consulting engineers who have had no practice for the last three years, they want something more to keep them alive and hearty. As one of the unemployed consultants said to the writer the other day: "This is the Government

which, like Moses, was going to lead us by the hand into the Promised Land, or at least those fortunate ones who were alive at all when they gave us leave to suck our sustenance from the Shannon after they had done with it themselves."

P. T. White.

Rostrevor, *April 1st*, 1927.

Faults in Flexibles.

Mr. J. W. Meares's letter in your issue of to-day calls for a reply.

We recommend "Feraflex" flexible cord with steel auxiliary conductors and asbestos separator as a general-purpose flexible cord, particularly for electrical heating appliances.

For vacuum cleaners, however, the "Anti Shock" flexible is specially recommended, as it is important for a flexible cord for such purposes as vacuum cleaners that the insulation protecting the conductors should be mechanically and electrically sound. Hence our recommendation of "Anti Shock" flexible cord for vacuum cleaners.

The "Anti Shock" flexible cord is made up with the insulated conductors embedded in a jacketing of flexible rubber, and over the rubber jacketing there is a stout polished yarn braiding.

We would like to take this opportunity of thanking Mr. J. W. Meares for his appreciation of our "Anti Shock" flexible.

Ward & Goldstone, Ltd.
(M. H. GOLDSTONE.)

Manchester, *April 1st*, 1927.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

22,560. "Metallic mirrors within electroionic discharge tubes." Edison Swan Electric Co., Ltd. September 9th, 1924. (239,861.)

22,744. "Wireless and other electrical apparatus." Paragon Rubber Manufacturing Co., Ltd., and G. W. Croot. September 11th, 1925. (267,172.)

24,914. "Electric accumulators for hand lamps." C. R. Fowler and E. M. Roberts. October 6th, 1925. (267,175.)

25,699. "Electric telegraphic systems." H. V. Higgitt and Eastern Telegraph Co., Ltd. October 14th, 1925. (267,180.)

27,664. "Telephone systems." Standard Telephones & Cables, Ltd. (B. A. Turkhud and F. de Fremery). November 3rd, 1925. (267,181.)

30,172. "Electrical oscillatory circuits such as those employed in wireless telegraphy." K. E. Edgeworth. November 30th, 1925. (267,196.)

30,581. "Wireless receiving apparatus." A. H. Midgley. December 3rd, 1925. (Cognate application 211/26.) (267,198.)

30,583. "Electric contact springs and the operation thereof." Siemens Bros. & Co., Ltd., and W. E. Goodwin. December 3rd, 1925. (267,199.)

30,845. "Electric accumulators." H. Leitner. December 7th, 1925. (267,205.)

30,997. "Method of and apparatus for the production or generation of sounds or tones." M. J. Goldberg & Sohne Ges. December 8th, 1924. (244,133.)

31,165. "Control of rotary convertors." A. Reyrolle & Co., Ltd., Mather and Platt, Ltd., R. E. Grime and B. H. Leeson. December 10th, 1925. (267,217.)

31,195. "Automatic and semi-automatic telephone systems." Standard Telephones & Cables, Ltd., and G. C. Hartley. December 10th, 1925. (267,220.)

31,363. "Wireless receivers of the superheterodyne type." L. Levy. December 12th, 1924. (244,484.)

31,572. "Method of treating, and an electric furnace for the treatment of, carbonaceous material." J. J. Naugle. December 14th, 1925. (267,240.)

31,579. "Magnetic vibratory devices." Standard Telephones & Cables, Ltd., and H. J. Gowring. December 15th, 1925. (267,243.)

32,386. "Control of electrically-operated railway points." P. E. Carter and R. Connell. December 22nd, 1925. (267,249.)

32,898. "Brush-holders for dynamo-electric machines." Bruce Peebles and Co., Ltd., and F. G. Brookhouse. December 30th, 1925. (267,252.)

1926.

686. "Containers for electrical apparatus." Metropolitan-Vickers Electrical Co., Ltd. January 16th, 1925. (246,131.)

774. "Automatic control devices for electric arc-welding apparatus and other purposes." W. R. Hume. January 11th, 1926. (267,256.)

895. "Horns for wireless receiving sets, gramophones, and other musical instruments." S. F. McCord. June 18th, 1926. (267,258.)

1,442. "Electric signalling devices." H. Karabetz. January 19th, 1925. (248,179.)

3,732. "Wireless electric signalling systems." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). February 9th, 1926. (267,279.)

3,856. "Brakes of tramcars and like vehicles." A. W. Maley. February 10th, 1926. (267,280.)

4,073. "Oil-immersed electric transformers." Bruce Peebles & Co., Ltd., and J. W. Rodger. February 12th, 1926. (267,284.)

4,275. "High-frequency power supply for electric induction furnaces" C. Lorenz Akt. Ges. February 13th, 1927. (247,949.)

4,281. "Electric motor control systems." Express Lift Co., Ltd., and J. H. Meacock. February 15th, 1926. (267,289.)

4,881. "Circuits of train-lighting and similar installations and switch devices for controlling the said circuits." J. Stone & Co., Ltd., and A. H. Darker. February 19th, 1926. (267,294.)

6,594. "Magneto electric machines." J. Lucas, Ltd., and E. O. Turner. March 9th, 1926. (267,304.)

6,902. "Electromotors." Aircraft Patents, Ltd., and G. H. Cooke. March 12th, 1926. (267,310.)

7,045. "Manufacture of substantially non-sagging coiled filaments from highly refractory metal." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). March 13th, 1926. (267,312.)

8,615. "Variable electric condensers and the like." R. Atkins and Ormond Engineering Co., Ltd. March 30th, 1926. (267,334.)

9,540. "Foundation for "A" and "H" poles supporting telegraph, telephone, and electric power wires." J. E. Rutter. April 12th, 1926. (267,340.)

10,236. "Sound-receiving devices for submarine signalling." Walker Signal and Equipment Corporation. April 25th, 1925. (251,269.)

11,108. "Driving arrangements for electrically-driven vehicles." J. Buchli. February 12th, 1926. (265,911.)

11,322. "Electrically heated lighters for smokers." E. W. Puckert. April 29th, 1926. (267,349.)

11,669. "Electro-magnetic clocks." M. P. Favre-Bulle. May 3rd, 1926. (267,351.)

14,143. "Artificial line for use in cross-talk calibration in telephony." Felten & Guilleaume-Carlswerk Akt. Ges. November 12th, 1925. (261,338.)

16,158. "Variable self-inductances." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. June 29th, 1925. (254,338.)

16,376. "Electrically-driven rail vehicles." J. Buchli. June 29th, 1926. (Addition to 265,911.) (267,376.)

16,595. "Transmission and reproduction of views, scenes, or images by wires or wirelessly." J. L. Baird. September 1st, 1925. (Divided application on 266,564.) (267,378.)

18,735. "Apparatus for the treatment of organisms with electrical current." W. T. Arnberg. July 29th, 1925. (256,236.)

18,847. "Train-control systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. December 9th, 1925. (Divided application on 266,485.) (267,388.)

19,507. "Separate drive for the axles of electric motor vehicles." Maschinenfabrik Oerlikon. July 9th, 1926. (267,393.)

19,746. "Voltage or current regulators." International General Electric Co., Inc. August 10th, 1925. (256,672.)

20,171. "Electromagnetic circuit interrupters or switches." Metropolitan-Vickers Electrical Co., Ltd. August 5th, 1925. (257,594.)

20,330. "Impedance measuring bridges." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). August 17th, 1926. (267,397.)

20,605. "Electric cells." G. Weissmann. November 30th, 1925. (262,049.)

21,794. "Vapour-discharge valves, mercury-vapour rectifiers, and the like discharge devices." Siemens & Halske Akt. Ges. September 3rd, 1925. (257,951.)

22,621. "Coil sockets for electric cables." Siemens-Schuckertwerke Ges. September 15th, 1925. (258,583.)

23,941. "Hollow cables for electric overhead lines." Siemens Schuckertwerke Ges. February 4th, 1926. (265,544.)

24,370. "Electric switching arrangements for use with the lighting systems of motor-cars." K. M. Chapman and G. E. Chapman. October 3rd, 1925. (259,239.)

24,450. "Alternating-current rectifiers." C. Lorenz Akt. Ges. October 2nd, 1925. (259,243.)

24,723. "Lighting fixtures." Korrectolite Co., Inc. July 15th, 1925. (Divided application on 252,353.) (259,256.)

24,724. "Lighting fixtures." Korrectolite Co., Inc. July 15th, 1925. (Divided application on 252,353.) (259,257.)

25,282. "Cooling apparatus for electric transformers." O. Happel. October 11th, 1926. (267,418.)

26,672. "Projecting lamps." G. H. Cushing. November 5th, 1925. (260,976.)

26,870. "Controllers for electric motors." International General Electric Co., Inc. October 27th, 1925. (260,598.)

27,017. "Electric incandescent lamps." British Thomson-Houston Co., Ltd. October 29th, 1925. (260,607.)

29,500. "Manufacture of electric incandescent lamps." General Electric Co., Ltd. May 1st, 1926. (267,438.)

30,291. "Holders for tubular electric lamps." H. Friedeberg. November 30th, 1926. (Addition to 262,424.) (267,442.)

30,434. "Pinion gear, especially for electrical vehicles with separate axle drive." Maschinenfabrik Oerlikon. December 4th, 1925. (262,434.)

31,148. "Methods of manufacture of magnetic bodies from powdered material." International General Electric Co., Inc. December 8th, 1925. (262,789.)

31,818. "Automatic machines for manufacturing electric incandescent lamps and similar articles." British Thomson-Houston Co., Ltd. January 19th, 1926. (264,805.)

31,923. "Incandescent electric lamps and like sealed envelopes." A. J. Stephens (Naamlooze Vennootschap Gloeilampenfabriek Nymegen). December 16th, 1926. (267,448.)

32,432. "Lead cable presses." F. Krupp Grusonwerk Akt. Ges. February 6th, 1926. (265,556.)

1927.

1,415. "Lead cable presses." Krupp Grusonwerk Akt. Ges. January 28th, 1926. (Addition to 259,834.) (265,180.)

5,728. "Variable electric condensers." M. J. Goldberg & Sohne Ges. December 11th, 1924. (Divided application on 244,480.) (266,760.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 30th:—

Snake Head (design only). No. 472,068. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Hydrawerk Elektricitats Gesellschaft, Charlottenburg, Berlin, Germany. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

Carlton Battery (lettering and design). No. 473,039. Class 8. Electric pocket, hand lamp and torch batteries, batteries for radio-telegraphy, and dry cells.—E. Fischbach, trading as A. Finnie & Co., 13, Carlton Place, Glasgow.

T.S.F. (lettering and design). No. 477,702. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—T.S.F., Ltd., 10, Duke Street, Adelphi, W.C.2.

Saco. No. 476,049. Class 13. Electric fuses.—Sykes & Dyson, Ltd., Queen's Mill Road, Huddersfield.

3 Spires (lettering and design). No. 476,183. Class 13. Transmission chains of ordinary metal.—Coventry Chain Co., Ltd.

Bird (design only). No. 473,988. Class 14. Platinum-pointed screws for magnetos.—R. J. Dingley, trading as W. H. Reynolds & Co., 11, Kev Hill Drive, Birmingham.

Sotonite. No. 473,203. Class 40. Copper wire covered with india-rubber or gutta-percha or with compounds of these.—Pirelli General Cable Works, Ltd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERGELE.—Children's Sanatorium for Manchester Corporation Public Health Committee; City Architect, Town Hall, Manchester.

ARDEER.—School extensions, with electrical work, for Ayrshire E.C.; William Reid, master of works, Education Offices, Ayr.

ASHFORD (Kent).—Additional 60 houses, Beaver, for the U.D.C.; W. Terrill, surveyor, 5, North Street.

AYR.—Extension to bakery (£1,800), for W. C. Galbraith and Sons, 80, High Street; the manager.

BACUP.—Roman Catholic Church, Stacksteads; Mullen and Durkin, builders, Burnley.

BARNSTAPLE.—Extensions, High Street, for the *North Devon Journal*; Friend & Kelly, architects, Boutport Street.

BEXHILL.—Houses, Collington Lane, Little Common Lane, and Sutherland Avenue; J. E. Maynard, Collington Avenue. 36 houses, Burnt House Farm; borough engineer.

BEXLEY (Kent).—Additional 64 houses, for the U.D.C.; surveyor.

BLACKPOOL.—Hydro, Harrowside, for Town Council; borough surveyor.

BOURNEMOUTH.—Wesleyan Church, Alma Road (£5,000); Jones & Seward, builders.

BRADFORD.—Extensions to St. James' public abattoirs (£50,000); city architect, Town Hall.

BRAMPTON (Cumberland).—Housing scheme (33), for the Brampton Public Utility Society, Ltd.; secretary.

BURSLEM.—Electric heating, St. Joseph's Catholic Church; trustees.

CANADA (Ottawa).—Extensions to the Chateau Laurier Hotel ($2,000,000), Canadian National Railway; Government Offices, Wellington Street (first section, $500,000).

CHELMSFORD.—Reservoirs and waterworks (£60,000); borough engineer and W. & C. French.

COLWYN BAY.—Science block class and social rooms, Penrhos College; J. M. Porter & Co., architects, the estate office.

COULSDON AND PURLEY.—Fire station, &c., for the U.D.C.; Nicholls & Hughes, architects, 4, Raymond Buildings, London, W.C.

DONCASTER.—Warehouse, for the Co-operative Society; T. H. Johnson, architect, 20, Priory Place.

DUNSTABLE.—Church, Luton Road, for the Wesleyan trustees.

EDINBURGH.—New Home for the Blind (£10,000); Managers, Royal Blind Asylum and School.

ENFIELD.—Railway sidings, L.N.E.R.

FLEET (Hants.).—Telephone exchange; office of works.

GUILDFORD.—School, Stoke Hill (£14,200), for the borough E.C.; the clerk.

GUISELEY.—Housing scheme (75), Hawkshead Estate; M. Rennard, clerk to U.D.C.

HEMSWORTH (Yorks.).—Palais de danse, for Fred Partridge; Reginald Goodworth, architect, 5, Market Hill, Barnsley.

IRISH FREE STATE (Bray, Co. Wicklow).—81 houses for the U.D.C.; E. M. Murphy, surveyor to Council, 27, Molesworth Street, Dublin.

(Dublin).—Reconstruction of Butt Bridge, and a further new bridge (£300,000); Port and Docks Board.

(Fethard, Co. Tipperary).—Rebuilding Tullemaine Castle (electric lighting), for Major Morel; J. Hearne & Son, builders, Waterford.

KINGSTON-ON-THAMES.—Additional 58 houses, for the T.C.; borough surveyor. Extensions, Tiffin Boys' School (£42,000); Governors.

KINGSWOOD (Bristol).—Re-erection of portion of motor-cycle works, for Douglas Bros., Ltd. (£100,000); W. H. E. Millman, managing director.

LANARK.—Garage, showrooms, shops and arcade, Bannatyne Street; proprietor of the Caledonian Garage.

LONDON (Barking, E.).—Additional housing schemes (337), Upney Estate, for the U.D.C.; housing architect. Workshop and garages, Ripple Road; H. & J. Alleston. 28 houses, Buller Road; E. Glenny & Son.

(Becontree, E.)—Church, Becontree Avenue; Essex Baptist Association. 30 shops and houses, Becontree Avenue; W. White.

(Bethnal Green, E.).—44 tenements, Brady Street; Rowley Bros., Ltd., Tottenham, for L.C.C.

(Ilford, E.).—26 houses, Albemarle Gardens, and 9 shops, Victoria Parade; Suburban Developments, Ltd. Congregational Church, Broomhill Lane; G. Baines & Son. Elementary School, Redbridge; Education Committee.

(Stepney, E.).—154 flats, New Gravel Lane; borough engineer.

(Finsbury, N.).—Extensions, Technical College; Central Foundation Managers.

(Greenwich, S.E.).—Additional 80 houses, Charlton Park, for the T.C.; borough surveyor.

(Lewisham, S.E.).—1,266 houses, Downham Estate; Holland, Hannen & Cubitts, for L.C.C.

(Southwark, S.E.).—Reconstruction premises in Stamford Street.—Messrs. J. Sainsbury, Ltd.

(Hammersmith, S.W.).—Reconstruction, St. Hubert's School, for L.C.C.; Triggs & Co.

LONG SUTTON (Lincs.).—Secondary School, for Holland E.C.; director of education, Spalding.

MALDEN.—Conversion of workhouse into mental hospital: Harbrow, Ltd., for Middlesex C.C.

MERSHAM.—Development, Mersham Manor Estate, R. H. and R. W. Clutton.

MERTON.—Elementary School, Merton Abbey; Burges and Son, for Surrey Education Committee.

MILNROW.—Housing scheme (30), Bridges Road, Newbey; A. Travis, architect, Union Bank Chambers, Rochdale.

MITCHAM.—Secondary School for Girls; Surrey Education Committee.

MORECAMBE.—Church, West End Road; Secretary, Christian Scientist Society.

NEWCASTLE-ON-TYNE.—School of Mines, Armstrong College, for the governors.

NEW MALDEN.—Factory near Burlington Road; Modern Homes & Estates, Ltd., of Motspur Park.

NEWPORT (Isle of Wight).—Club premises, High Street, for the Conservative Club; A. E. Marvin, Carisbrooke.

NEWPORT (Mon.).—Gwent Cathedral (£500,000), for Monmouth Diocesan Conference; Dr. Howell Green, Bishop.

NORTON.—Elementary School, West Riding Education Committee.

PEWSEY (Wilts.).—Housing scheme (40), for the R.D.C.; Walter F. Bickford, architect.

RICHMOND-ON-TEES.—Garage (£8,000), Catterick Camp, for the Motor Delivery Co., Grange Road, Darlington; G. Dougill & Sons, builders, Darlington.

RUGELEY (Staffs.).—Works extensions, Keystone Road, for J. Key & Sons.

SELSDON (Surrey).—50 houses, Garden Village; Richard Costain & Sons.

SOUTHEND-ON-SEA.—St. Margaret's Church, Leigh; Graham Lloyd, architect.

STACKSTEADS (Lancs.).—Roman Catholic Presbytery; Mullin & Durkin, builders, Burnley.

SWADLINCOTE.—Garage for 50 'buses, for the Midland Red Motor Services; traffic manager, Bearwood, Birmingham.

SWILLINGTON (Yorks.).—School, for West Riding E.C.; director of education, County Hall, Wakefield.

TADCASTER.—Nurses' Home, Board of Guardians.

THETFORD (Suffolk).—Hospital (£6,500), for the hospital committee; Mr. Boardman, architect.

THORNE.—New buildings for Grammar School; West Riding Education Committee.

TYNEMOUTH.—New pavilions, isolation hospital, Balkwell; borough engineer.

UPPER WARLINGHAM (Surrey).—Nurses' Home (56 beds), Mental Hospital, for Croydon T.C.; H. Carter Pegg, architect, 35, Parliament Street, London, S.W.

UXBRIDGE.—Garage and petrol store, Cowley Road; Anglo-American Oil Co., Ltd.

WINCHESTER.—Additional 40 houses, Stanmore, for the T.C.; borough surveyor.